

1. A card is drawn from a 52-card deck. What is the probability of NOT drawing a face card or a spade?

$$P(\text{face or spade}) = P(\text{face}) + P(\text{Sp}) - P(\text{Face \& Spade})$$

$$= \frac{12}{52} + \frac{13}{52} - \frac{3}{52} = \frac{22}{52} = \frac{11}{26}$$

$$P(\text{not Face or Sp}) = 1 - P(\text{Face or Sp})$$

$$= 1 - \frac{11}{26} = \frac{15}{26}$$

$$\frac{15}{26}$$

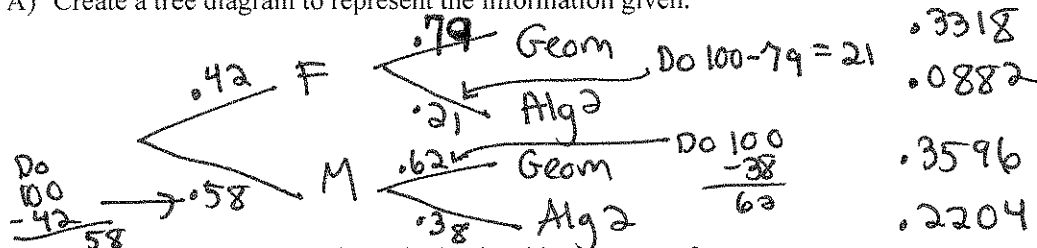
2. A bag of marbles contains 6 white marbles, 4 red marbles, 7 green marbles and 8 black marbles. What is the probability of reaching in a getting a green marble then a white marble without replacing the first marble?

25 total

$$\frac{7}{25} \cdot \frac{6}{24} = \frac{42}{600} = \frac{7}{100} \text{ or } 7\%$$

3. A math club contains 42% females. Of the females, 79% are taking Geometry and the rest are taking Algebra 2. 38% of the males are taking Algebra 2, and the others take Geometry.

A) Create a tree diagram to represent the information given.



- B) What is the probability of a male that is taking geometry?

Fix

that

$$(.58)(.62) = .3596$$

$$\boxed{35.96\%}$$

- C) What is the probability of a student in the math club taking Algebra 2?

$$(.42)(.21) + (.58)(.38) = .3086$$

$$\boxed{30.86\%}$$

- D) What is the probability of a student being a male, given a student that takes Geometry?

$$P(M | \text{Geom}) = \frac{P(M \& \text{Geom})}{P(\text{Geom})} = \frac{(.58)(.62)}{(.58)(.62) + (.42)(.79)} = \frac{.3596}{.6914} = .5201$$

$$\boxed{52.01\%}$$

4. Bob wants to buy a new Ipod. He can choose from 5 colors, 3 different types of memory, and 2 types of headphones. How many ways can Bob choose an Ipod?

$$\frac{5}{\text{color}} \cdot \frac{3}{\text{memory}} \cdot \frac{2}{\text{head-phones}} = \boxed{30}$$

5. A sports team consists of 16 players. The coach needs to assign a Captain, Co-Captain and a Team Assistant. How many ways can the coach determine these positions?

P → order matters because positions

$$16 P_3 = \boxed{3360}$$

6. There is a relationship between the radius of an orbit and the time of one orbit for the moons of Saturn. The table below lists data for 11 of Saturn's 30 moons. Round answers to the hundredths place.

Moon	Atlas	Prometheus	Pandora	Epimetheus	Janus	Mimas	Enceladus	Tethys	Dione	Helene	Rhea
Radius (100,000 km)	1.38	1.39	1.42	1.51	1.51	1.86	2.38	2.95	3.77	3.77	5.27
Time (days)	0.60	0.61	0.63	0.69	0.70	0.94	1.37	1.89	2.74	2.74	4.52

- a. Find the power function model for the data for orbital time versus radius.

$$y = 0.37 \cdot x^{1.5}$$

- b. Predict the orbital radius of Titan, which has orbit time of 21.277 days.

$$\underline{14.75}$$

- c. Find the orbital time for Phoebe, which has an orbit radius of 12,952,000 km.

Given y-value → $y_2 = 21.277$ intersect

Given x-value → $y_1(129.52)$

$$\underline{558 \text{ days}}$$

Solve the following. Show all your work! Use separate paper, if needed.

7. $\frac{x+3}{x} - \frac{7x}{x+2} = \frac{14}{x^2+2x}$

LCD: $x(x+2)$

EV: $x=0, -2$

$(x+3)(x+2) - 7x = 14$

$x^2 + 5x + 6 - 7x = 14$

$x^2 - 2x + 6 = 14$

$x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

$x = 4, -2$

$x = 4$

8. Solve the following equation for x and write in set notation: $\left[\frac{3}{2}x - 4\right] = 8$



$8 \leq \frac{3}{2}x - 4 < 9$

$12 \leq \frac{3}{2}x < 13$

$8 \leq x < \frac{26}{3}$

9. The current I in an electrical conductor varies inversely with the resistance R of the conductor. The current is $\frac{1}{3}$ amps when the resistance is 360 Ω . Use this information to write an equation to model the relationship.

$y = \frac{k}{x}$

$I = \frac{k}{R}$

$\frac{1}{3} = \frac{k}{360}$

$k = 120$

$I = \frac{120}{R}$

If resistance is 60 Ω , find current
 $I = \frac{120}{60}$
 $I = 2$ amps

10. Indicate how the function is changed from the parent graph. $f(x) = -\sqrt{x+8} - 5$

reflected over x-axis, left +8, down 5

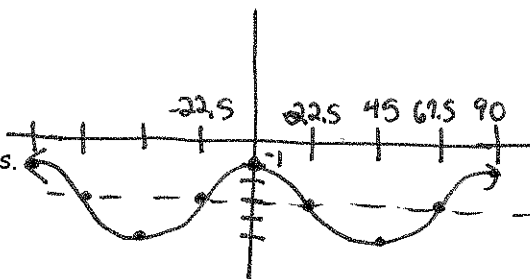
11. For the function $y = -3 + 2\cos(4x)$, find:

a. The amplitude $|2| = 2$

b. The period $\frac{360}{4} = 90^\circ$

c. The equation of the midline $y = -3$

d. Graph one period in the negative and positive directions.

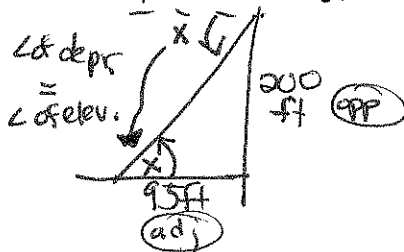


12. A building 200 feet tall casts a 95 foot long shadow. If a person looks down from the top of the building, what is the measure the angle of depression? (Assume the person's eyes are level with the top of the building.)

$\tan(x) = \frac{200}{95}$

$x = \tan^{-1}\left(\frac{200}{95}\right)$

$x = 64.6^\circ$



13. Find all solutions to $2\sin(2x) + 1 = 0$.

$2\sin(2x) = -1$
 $\sin(2x) = -\frac{1}{2}$

$2x = \sin^{-1}\left(-\frac{1}{2}\right)$

$2x = -30^\circ$

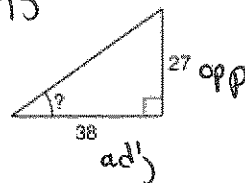
$x = -15^\circ$ or 345°

14. Find the measure of the indicated angle to the nearest degree.

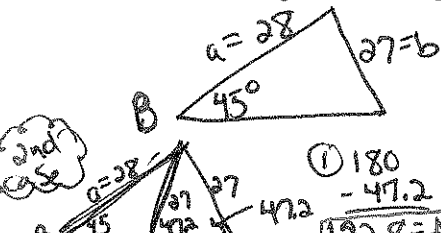
$\tan(x) = \frac{27}{38}$

$x = \tan^{-1}\left(\frac{27}{38}\right)$

$x = 35^\circ$



15. Solve triangle ABC if angle B = 45 degrees, a = 28, and b = 27. (1st case)



SSA \rightarrow 2 cases
 b/c side across from angle < other side

① 180
 -47.2
 132.8 = A

② 180
 -132.8
 -45 B

③ $\sin(A) = \sin(45)$
 $\frac{c}{28} = \frac{27}{28}$
 $c = 27$

① $\frac{\sin(45)}{27} = \frac{\sin A}{28}$
 $28 \sin(45) = 27 \sin A$
 $.7333 = \sin A$

② 180
 -47.2A
 -45B
 $87.8 = C$

③ $\frac{\sin(87.8)}{c} = \frac{\sin(45)}{27}$
 $\frac{c \sin(45)}{\sin(45)} = \frac{27 \sin(87.8)}{\sin(45)}$
 $c = 38.2$

16. When placing an order of candy from an online store, you have to choose from 10 different flavors of candy. Each order must contain at least 4 different types of candy. How many ways can you place an order?

$$10C_4 + 10C_5 + 10C_6 + 10C_7 + 10C_8 + 10C_9 + 10C_{10} = 210 + 252 + 210 + 120 + 45 + 10 + 1 = \boxed{848}$$

17. We use 10 digits in our number system. How many 5-digit "numbers" can be formed if no digits are repeated and zero is not allowed in the first position?

$$\begin{matrix} \uparrow & \uparrow & & & \\ \text{not zero} & 0-9 \text{ but not repeat a \#} & & & \\ 9 & \cdot & 9 & \cdot & 8 & \cdot & 7 & \cdot & 6 \end{matrix} = \boxed{27216}$$

18. A bag contains 26 tiles with a letter on each, one tile for each letter of the alphabet. What is the probability of reaching into the bag and randomly choosing a tile with one of the first 10 letters of the alphabet on it or randomly choosing a letter with a vowel?



$$P(\text{1st 10}) + P(\text{vowel}) - P(\text{1st 10 \& vowel}) = \frac{10}{26} + \frac{5}{26} - \frac{3}{26} = \frac{12}{26} = \frac{6}{13} \approx 46.2\%$$

19. At a local high school, the probability that a student takes Biology and Chemistry is 16%. The probability that a student takes Chemistry is 42%. What is the probability that a student takes Biology, given that the student takes Chemistry?

$$P(\text{Bio} | \text{Chem}) = \frac{P(\text{Bio \& Chem})}{P(\text{Chem})} = \frac{0.16}{0.42} = \frac{8}{21} \approx 38.1\%$$

20. There are 6 women and 7 men trying out for 3 positions on the TV show Survivor.

- a) In how many ways can the 3 positions be filled? $13 \text{ total} \rightarrow 13C_3 = \boxed{286}$
- b) In how many ways can the positions be filled if all women are hired? $6 \text{ women} \rightarrow 6C_3 = \boxed{20}$
- c) In how many ways can the positions be filled if 2 women and 1 man are hired? $\frac{6C_2 \cdot 7C_1}{W \quad M} = 15 \cdot 7 = \boxed{105}$

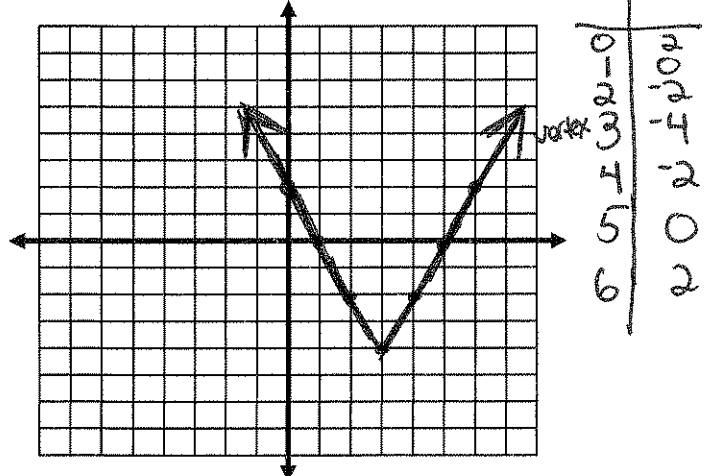
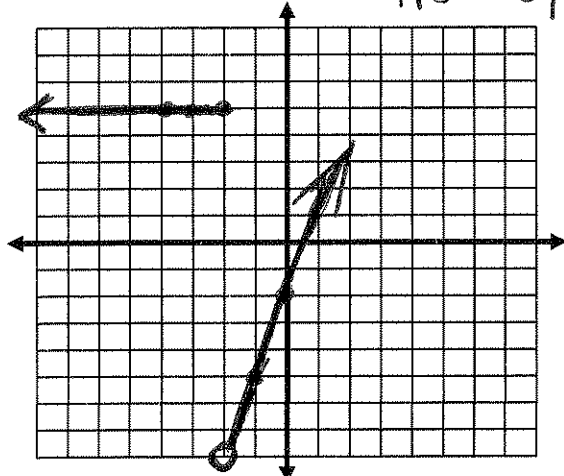
For each equation, draw a graph, indicating at least 5 points. Then tell its domain, its range, and other requested information.

21. $g(x) = \begin{cases} 5 & \text{if } x \leq -2 \\ 3x - 2 & \text{if } x > -2 \end{cases}$

top rule	bottom rule
$x \leq -2$	$x > -2$
5	-8
-3	-5
-4	-2
5	3(6)-2

22. $f(x) = 2|x - 3| - 4$

absolute value so V shape



0	-1
1	-2
2	-3
3	-4
4	-3
5	-2
6	-1
7	0
8	1

D: All reals (R) R: $y > -8$

$g(-4) = \underline{5}$ $g(3) = \underline{7}$ $3(3)-2$

$g(-2) = \underline{5}$ $g(0) = \underline{-2}$ $3(0)-2$

D: all reals (R) R: $y \geq -4$

Changed from parent: right 3, down 4 stretched vertically by 2

$f(-2) = \underline{6}$ $f(0) = \underline{2}$

$2|-2-3|-4$ $2|0-3|-4$

$2|-5|-4 = 10-4$ $2|-3|-4$

$2|1|-4$

23. Write an equation for the translation of $y = \frac{5}{x}$ that has the asymptotes $x = -2$ and $y = -8$.

$$y = \frac{5}{x+2} - 8$$

Solve the following. Show all your work! Use separate paper, if needed.

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

$$(\sqrt{3x+7})^2 = (x-1)^2$$

$$3x+7 = (x-1)(x-1)$$

$$3x+7 = x^2 - 2x + 1$$

$$-3x - 7 \quad -3x - 7$$

$$0 = x^2 - 5x - 6$$

$$0 = (x-6)(x+1)$$

~~$x = 6$~~

$$\sqrt{3 \cdot 6 + 7} = 6 - 1$$

$$\sqrt{25} = 5 \checkmark$$

$$\sqrt{3 \cdot (-1) + 7} = -1 - 1$$

$$\sqrt{4} \neq -2$$

25. $(2x+3)^{3/4} - 2 = 6$

$$(2x+3)^{3/4} = 8$$

$$((2x+3)^{3/4})^{4/3} = (8)^{4/3}$$

moves down 8
so $y = -8$ is asymptote (HA)
moves left
so $x = -2$ is V.A.

$$2x+3 = \sqrt[3]{8^4}$$

use calc Math 4: $\sqrt[3]{(8^4)}$ OR break down by hand

$$2x+3 = \sqrt[3]{8 \cdot 8 \cdot 8 \cdot 8}$$

$$2x+3 = 8 \sqrt[3]{8}$$

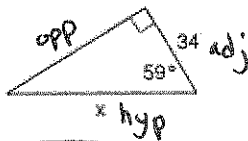
$$2x+3 = 8 \cdot 2$$

$$2x+3 = 16$$

$$2x = 13$$

$$x = 13/2$$

26. Find the measure of x.



$$\cos(59) = \frac{34}{x}$$

$$x \cos(59) = 34$$

$$\frac{x \cos(59)}{\cos(59)} = \frac{34}{\cos(59)}$$

$$x = 66.01$$

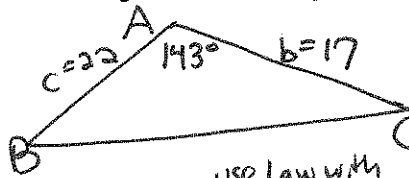
27. Find the area of triangle ABC if angle C = 30 degrees, b = 6, and a = 8.

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} (8)(6) \sin(30)$$

$$= 12 \text{ units}^2$$

28. Given triangle ABC, find angle B if angle A = 143 degrees, c = 22, and b = 17.



SAS \rightarrow use Law of Cosine

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 17^2 + 22^2 - 2(17)(22)\cos(143)$$

$$a^2 = 1370.38$$

$$a = 37.0$$

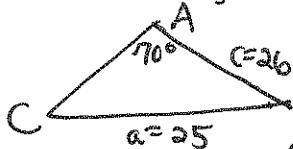
Short side and with Law of Sine

$$\frac{\sin(143)}{37.0} = \frac{\sin B}{17}$$

$$\frac{17 \sin(143)}{37.0} = \frac{37.0 \sin B}{37.0}$$

$$16.01 = \sin B$$

29. Solve triangle ABC if angle A = 70 degrees, c = 26, and a = 25.



SSA \rightarrow 2A scenario

because side across from angle < other side

$$\frac{\sin(70)}{25} = \frac{\sin C}{26}$$

$$\frac{26 \sin 70}{25} = \frac{25 \sin C}{25}$$

$$77.8^\circ = C$$

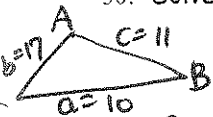
$$\frac{\sin(32.2)}{25} = \frac{\sin(70)}{26}$$

$$\frac{b \sin(70)}{\sin(70)} = \frac{25 \sin(32.2)}{\sin(70)}$$

$$b = 14.2$$

$$16.1^\circ = B$$

30. Solve triangle ABC if a = 10, b = 17, and c = 11.



SSS \rightarrow use Law of Cosine

Short side and with law of sine

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$17^2 = 10^2 + 11^2 - 2(10)(11)\cos B$$

$$-103 = -220 \cos B$$

$$\frac{68}{-220} = \frac{-220 \cos B}{-220}$$

$$B = 108^\circ$$

$$\frac{\sin(A)}{10} = \frac{\sin(108)}{17}$$

$$\frac{17 \sin A}{10} = \frac{17 \sin(108)}{17}$$

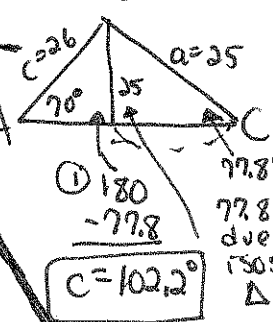
$$\sin A = .5594$$

$$A = 24^\circ$$

$$180 - 108 - 24 = 38^\circ$$

$$C = 38^\circ$$

OR 2nd case



$$\frac{\sin(70)}{25} = \frac{\sin B}{17}$$

$$\frac{17 \sin(70)}{25} = \frac{25 \sin B}{25}$$

$$7.8^\circ = B$$

$$\frac{\sin(7.8)}{25} = \frac{\sin(70)}{17}$$

$$\frac{25 \sin(7.8)}{\sin(70)} = \frac{25 \sin(70)}{\sin(70)}$$

$$2.6 = b$$