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

$P(\text{face or spade}) = P(\text{face}) + P(\text{spade}) - P(\text{Face \& spade})$
$\frac{12}{52} + \frac{13}{52} - \frac{3}{52} = \frac{22}{52}$

$P(\text{not F or S}) = 1 - P(\text{F or S})$
$1 - \frac{22}{52} = \frac{30}{52}$
$= \boxed{\frac{15}{26}}$

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?

$6 + 4 + 7 + 8 = 25 \text{ total}$

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

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.
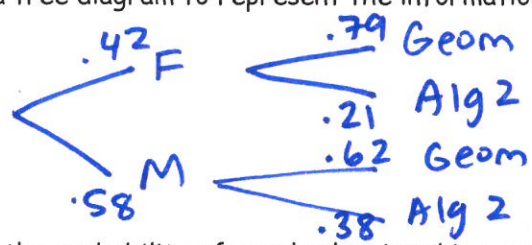
$(.42)(.79) = .3318$
$(.42)(.21) = .0882$
$(.58)(.62) = .3596$
$(.58)(.38) = .2204$

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

$(.58)(.62) = .3596$ → $\boxed{35.96\%}$

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?

$P(M | Geom) = \frac{P(M \text{ and } Geom)}{P(Geom)} = \frac{(.58)(.62)}{(.58)(.62) + (.42)(.79)} = \frac{.3596}{.6914} = .5201$ → $\boxed{52.01\%}$

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?

$5 \cdot 3 \cdot 2 = \boxed{30}$
color · Mem · headphones

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?

Permutation: order matters!

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

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. $y = 0.37 x^{1.5}$

Pwr Reg in calculator

b. Predict the orbital radius of Titan, which has orbit time of 21.277 days.   __14.75__

Given y-value → $y_2 = 21.277$ find intersection

c. Find the orbital time for Phoebe, which has an orbit radius of 12,952,000 km.   __558 days__

Given x-value → $\frac{12,952,000}{100,000}$
$y_1(129.52)$

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

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

$x(x+2)$

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

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

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

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

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

$x = 4, \cancel{-2} \rightarrow$ Excluded value

$\boxed{x = 4}$

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

① $\dfrac{3}{2}x - 4 \geq 8 \rightarrow 3x \geq 24$
$\dfrac{3}{2}x \geq 12 \rightarrow \boxed{x \geq 8}$

② $\dfrac{3}{2}x - 4 < 9 \rightarrow 3x < 26$
$\dfrac{3}{2}x < 13 \rightarrow \boxed{x < 26/3}$

Final

$\boxed{8 \leq x < 26/3}$
or
$[8, 26/3)$

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.

$y = \dfrac{k}{x}$ $I = \dfrac{k}{R}$ $y \tfrac{1}{3} = \dfrac{k}{360}$ $k = 120$ $\boxed{I = \dfrac{120}{R}}$

10. Explain how the function has 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 + 2cos(4x), find:
    a. The amplitude $|2| = \boxed{2}$
    b. The period $360/4 = \boxed{90°}$
    c. The equation of the midline $\boxed{y = -3}$
    d. Graph one period in the negative and positive directions.


22.5 45 67.5 90
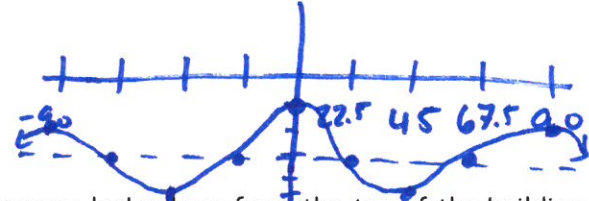
12. A building 200 feet tall casts a 95 foot long shadow. If a person looks down from the top of the building, what is the measure the angle of depression? (Assume the person's eyes are level with the top of the building.)
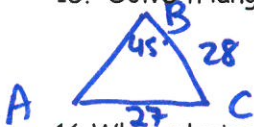

200 ft opp.   95 adj.

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

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

$\boxed{x = 64.6°}$
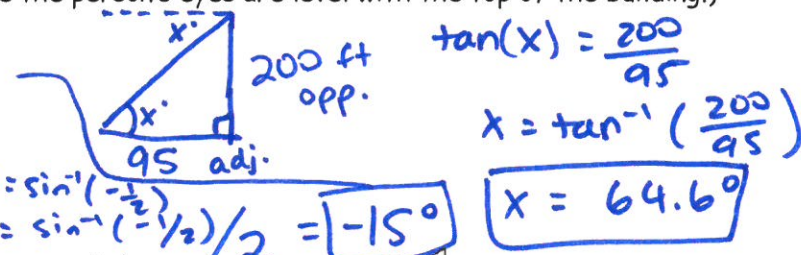
13. Find all solutions to 2sin(2x) + 1 = 0.

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

$2x = \sin^{-1}\left(-\dfrac{1}{2}\right)$
$x = \sin^{-1}\left(-\dfrac{1}{2}\right)/2 = \boxed{-15°}$

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

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

$\boxed{x = 35°}$

27 opp   38 adj
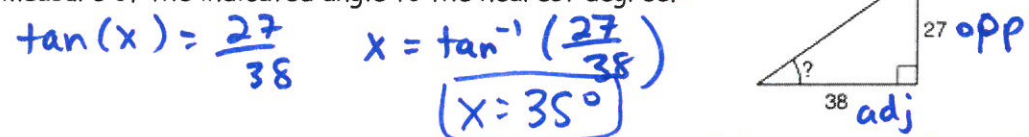
15. Solve triangle ABC if angle B = 45 degrees, a = 28, and b = 27.   SSA → ambiguous case

Case 1: $\angle A = 47.2°$
$\angle C = 87.8°$
$C = 38.2$

Case 2: $\angle A = 132.8°$
$\angle C = 2.2°$
$C = 1.5$

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?

$_{10}C_4 + {}_{10}C_5 + {}_{10}C_6 + {}_{10}C_7 + {}_{10}C_8 + {}_{10}C_9 + {}_{10}C_{10} = \boxed{848}$

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?

$\underline{9} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} = \boxed{27216}$

not 0   0-9 but no repeats

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?

1st 10   vowels

B C A O
D F E U
G H J I

$\frac{10}{26} + \frac{5}{26} - \frac{3}{26} = \frac{12}{26} = \boxed{\frac{6}{13}} = 46.2\%$

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?

$P(Bio \mid Chem) = \dfrac{P(Bio \text{ and } chem)}{P(chem)} = \dfrac{.16}{.42} = \boxed{\dfrac{8}{21}} = 38.1\%$

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

$6 + 7 = 13$

a) In how many ways can the 3 positions be filled?

$_{13}C_3 = \boxed{286}$

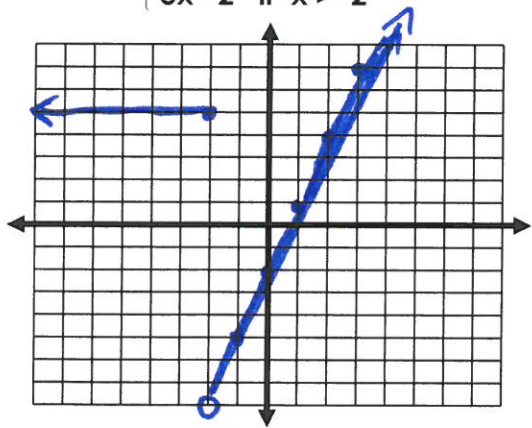b) In how many ways can the positions be filled if all women are hired?

women $\rightarrow$ $_6C_3 = \boxed{20}$

c) In how many ways can the positions be filled if 2 women and 1 man are hired?

$\underset{w}{_6C_2} \cdot \underset{m}{_7C_1} = 15 \cdot 7 = \boxed{105}$

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

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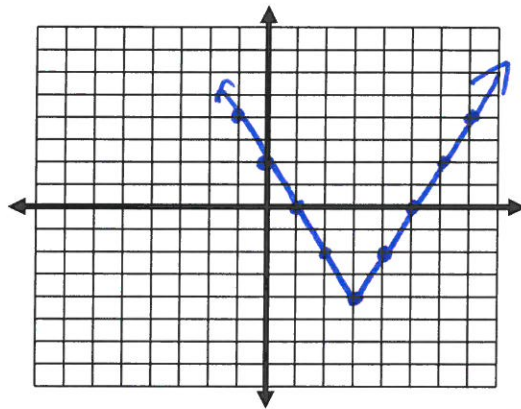$$g(x) = \begin{cases} 5 & \text{if } x \le -2 \\ 3x - 2 & \text{if } x > -2 \end{cases}$$

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

↳ absolute value

D: $(-\infty, \infty)$ R: $(8, \infty)$

g(-4) = 5 top rule   g(3) = 7 3(3)-2

g(-2) = 5 top rule   g(0) = -2 3(0)-2

D: $(-\infty, \infty)$ R: $[-4, \infty)$

Changed from parent: right 3, down 4, vert. stretch by 2

f(-2) = 6 f(0) = 2

$2|-2-3|-4$ $2|0-3|-4$
$2|-5|-4 = 10-4$ $2|-3|-4$
                   $2|3|-4 = 6-4$

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

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

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

24. $\left(\sqrt{3x+7}\right)^2 = (x-1)^2$ ← FOIL!

$3x + 7 = x^2 - 2x + 1$ $x = 6, \cancel{-1}$

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

$0 = (x - 6)(x + 1)$ $\boxed{x = 6}$

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

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

$2x + 3 = 16$ $\boxed{x = 13/2}$
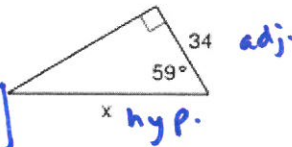
$2x = 13$

26. Find the measure of x.

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

$x = \dfrac{34}{\cos(59)} = \boxed{66.01}$
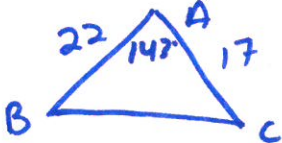
(triangle with 34 labeled adj., 59°, x labeled hyp.)

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

$Area = \dfrac{1}{2} ab \sin C$

$= \dfrac{1}{2}(8)(6)\sin(30) = \boxed{12 \ units^2}$

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

(triangle with 22, A 143°, 17, B, C)

① $a^2 = b^2 + c^2 - 2(b)(c)\cos A$
  $a^2 = 17^2 + 22^2 - 2(17)(22)\cos 143$
  $a^2 = 1370.38$ → Short side 2nd
  $\boxed{a = 37.0}$

② $\dfrac{\sin(143)}{37} = \dfrac{\sin B}{17}$

$B = \sin^{-1}\left(\dfrac{17\sin(143)}{37}\right)$

$\angle B = \boxed{16.1°}$

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

(triangle with A 70°, 26, C, 25, B)
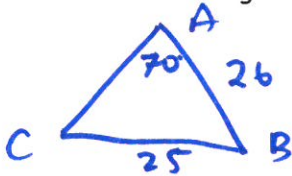
SSA → 2 cases

$\boxed{Case \ 1: \ \angle C = 77.8°}$
  $\angle B = 32.2°$
  $b = 14.2$

Case 2!
  $\angle C = 102.2°$
  $\angle B = 7.8°$
  $b = 3.6$

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

(triangle with A, b=17, c=11, C, 10, B)

SSS → law of cosine

① Big side 1st $17^2 = 10^2 + 11^2 - 2(10)(11)\cos B$
  $\dfrac{68}{-220} = \dfrac{-220\cos B}{-220}$ $B = \cos^{-1}\left(\dfrac{68}{-220}\right) = \boxed{108°}$
  Short side 2nd → $\angle C = 38°$
                     $\angle A = 34°$

31. Given $g(x) = 3x^2 - x$ and $h(x) = 5x + 1$, evaluate $g(x + 2) - 4h(x)$.

$3(x+2)^2 - (x+2) - 4(5x+1)$
$3(x^2 + 4x + 4) - x - 2 - 20x - 4$
$3x^2 + 12x + 12 - 21x - 6$

$\boxed{3x^2 - 9x + 6}$

32. If x varies directly as the cube root of y, and x = 6 when y = 27, find x when y = 64.

$x = K \cdot \sqrt[3]{y}$ $6 = K\sqrt[3]{27}$ $x = 2 \cdot \sqrt[3]{64}$
                           $6 = 3K$ $x = 2 \cdot 4 → \boxed{x = 8}$
                           $2 = K$

33. A summer camp offers canoeing, rock climbing, and archery. The following Venn diagram shows the types of activities the campers like.

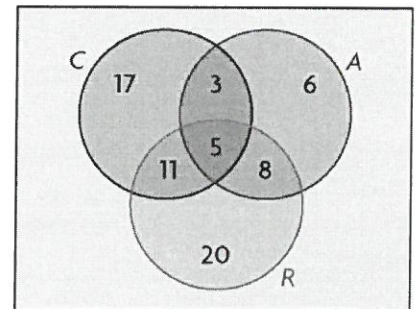a) Find the probability that a camper likes canoeing and archery.

$\dfrac{8}{70} = \boxed{\dfrac{4}{35}}$

b) Find the probability that a camper likes rock climbing or canoeing.

$\dfrac{44}{70} + \dfrac{36}{70} - \dfrac{16}{70} = \dfrac{64}{70} = \boxed{\dfrac{32}{35}}$

c) Find the probability that a camper does not like archery.

$\dfrac{48}{70} = \boxed{\dfrac{24}{35}}$

(Venn diagram: C 17, 3, A 6, 11, 5, 8, R 20)

$= 70$