1. Instead of having a calendar, a teacher uses two cubes to keep track of the day of the month. Each cube has exactly one digit on each side, but the teacher can express any integer from 01 to 31 (both cubes are used each day). How many faces have prime numbers?

   o 1 2 3

2. The digits 1, 2, 3, 4, and 9 are each used once to form the smallest possible **even** five-digit number. The digit in the tens place is

   12394

3. What is the best score in bowling assuming that you never bowl a strike?

4. Two cars start together around a two mile race track. The first car is traveling 100 miles per hour while the second car is traveling 60 miles per hour. When do the cars cross the starting line simultaneously?

   x = # of hrs   100 60
   100x   200
   60x   300 miles
   30 laps/hr   40 120
   50 laps/hr   100 200 300

5. If I have 2 more brothers than sisters and each of my brothers also has 2 more brothers than sisters, then how many more brothers than sisters does my oldest sister have?

   (D)   (B)   (E)   (E) (C)

6. In how many different ways can 35 cents be made using currently minted US coins?

7. How is a moon like a dollar?

(handwritten) one is mult of other

(handwritten drawing)

(handwritten)
$2, 4, 5, 7$ 2 4-digit

$\begin{array}{c|c} 2 & 4 \\ 7 & 4 \end{array}$ $\underline{2}\ \_\ \_\ \underline{7}\ \ \times 2$ $\times 3$

$\_\ \_\ \_\ \_\ '\ \underline{4}$

8. Give an expression that only uses addition of numbers with 8s to get 1,000.

(handwritten)
$888 + 88 + 8 + 8 + 8$

9. If $a \ominus b = \frac{a+b}{a-b}$, then $(6 \ominus 4) \ominus 3 =$

(handwritten)
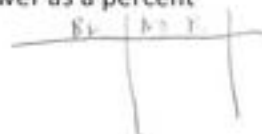$\frac{10}{2} = 5$ $5 \ominus 3$

$\frac{8}{2} = \boxed{4}$

10. Police report that 78% of drivers stopped on suspicion of drunk driving are given a breath test, 36% a blood test, and 22% both tests. What is the probability that a randomly selected DWI suspect is given a blood test or a breath test, but not both? Write your answer as a percent
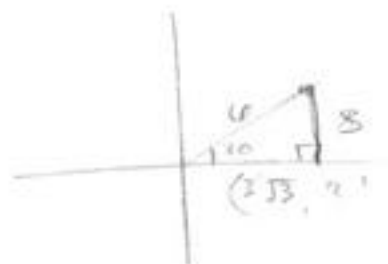
(handwritten tree diagram and table)
0.78 breath
no blood
0.22 no breath
blood
no blood

11. Find the rectangular coordinates of the point with the polar coordinates $\left(6, \frac{\pi}{6}\right)$.

(handwritten) $\frac{\pi}{6} = 30°$

(handwritten diagram)
6   8
30°
$(2\sqrt{3}, ?)$

$x\sqrt{3} = 6$
$x = \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = 2\sqrt{3}$

12. Find the five digit number in which the last digit is eight more than the first, the second digit is two less than the third and the fourth digit is 2 less than the last. The sum of all the digits is 25.

_ 3 5 7 9

13. There are 24 four-digit whole numbers that use each of the four digits 2, 4, 5, and 7 exactly once. Only one of these four-digit numbers is a multiple of another number on the list. What are these two four-digit numbers?

2457
x 2
1914

4577
x 2
9144

2457   4275   5427   7542
4572   4257   51172 7425
5724   4752   5274   7452
7245   2547   5247   2
2574   2745   4527
2754   2547   7254
4725   5742   7524

2547   2457
x 2   x 3
5094

2457

14. Arrange the numbers 1 through 9 on a tic tac toe board such that the numbers in each row, column, and diagonal add up to 15.

8	2	7
	1	6
3		4

1 2 3
4 5 6
7 8 9

15. A baseball coach listed the possible batting orders for the first four batters, Allen, Gurge, Cotton and Denby. His only requirement was that Cotton could not bat immediately after Denby. How many different batting order choices did the coach have?

16. Ali's digital clock read 7:15 a.m. when she left for school. When she returned home 7 hours and 15 minutes later, the clock read 5:55 a.m. because the power had gone off during the day. If her clock automatically reset to 12:00 a.m. when power was restored, at what time that morning did the power return?

1:20

8:35

2457 2475
74-5

17. What is the greatest common factor of 8! and 4^3?

$$\frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{4 \cdot 4 \cdot 4} \qquad 4 \cdot 4 \cdot 4$$

$$\frac{16}{64}$$

$$(8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3(2)) \qquad 4 \,(4)(4)$$

18. Simplify:

$$\frac{1}{x} - \frac{2}{x^2 - 4x + 3} + \frac{3}{x^2 - 3x}$$

$$\frac{x^2 - 4x + 3 - x}{x^3 - 4x^2 + 3x} = \frac{x^2 - 5x + 3}{x^3 - 4x^2 + 3x} + \frac{3}{x^2 - 3x}$$

$$\frac{(x^2 - 3x)(x^2 - 5x + 3) + 3(x^3 - 4x^2 + 3x)}{(x^3 - 4x^2 + 3x)(x^2 - 3x)}$$

$$x^4 - 5x^3 + 3x^2 - 3x^3 + 15x^2 - 9x + 3x^3 - 12x^2 + 3$$

$$x^5 - 4x^4 + 3x^3 - 3x^4 + 12x^3 - 9x^2$$
$$x^4 - 5x^3$$

$$x^5 - 7x^4 + 15x^3 - 9x^2$$

19. There are 220 students in the sophomore class.
    115 take Journalism $J = 115$
    70 take Ceramics $C = 70$
    95 take Spanish $S = 95$
    20 take Journalism and Ceramics $J \cap C = 20$
    30 take Journalism and Spanish $J \cap S = 30$
    25 take Ceramics and Spanish $C \cap S = 25$
    15 take all 3 subjects $J \cap S \cap C = 15$

How many students are taking only one of three subjects?

$$J \cup C = 165$$

$$J \cup S = 180$$

$$C \cup S = 140$$

20. Find x if $\sqrt{\sqrt{\sqrt{x}}} = 2$

$$\left(\left(2^2 \right)^2 \right)^2 = x$$

$$4^2$$
$$(16^2)$$

$$2 \cdot 2 \cdot 2 \cdot 2$$

$$\begin{array}{r} 16 \\ \underline{16} \\ 96 \\ \underline{16} \\ 256 \end{array}$$
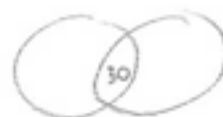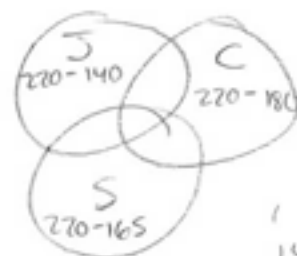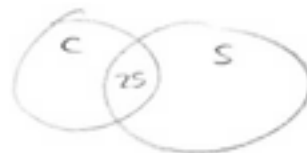
$$\begin{array}{r} 140 \\ 180 \\ \underline{165} \\ 485 \end{array}$$

$$\begin{array}{r} 600 \\ - 485 \\ \hline 175 \end{array}$$

$$16 \quad 16$$