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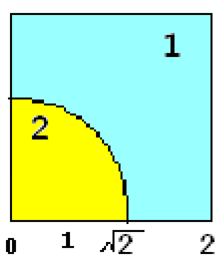
1. D	${}_7P_4 = \frac{7!}{3!} = 840$
2. D	Probability of getting 5, 6, 7 and 8 heads 8 heads = $\frac{1}{2}^{8}$ 7 heads = ${}_8C_1\frac{1}{2}\cdot\frac{1}{2}^{7} = 8\cdot\frac{1}{2}^{8}$ 6 heads = ${}_8C_2\frac{1}{2}^{8} = 28\cdot\frac{1}{2}^{8}$ 5 heads = ${}_8C_4\frac{1}{2}^{8} = 56$ probability is $\frac{1+8+28+56}{2^8} = \frac{193}{256}$
3. A	The probability of getting at least one 3 is the complement of getting NO 3's. The prob of no three on the die is $\frac{5}{6}$ and the prob of getting no three from the deck is $\frac{48}{52} = \frac{12}{13}$. Since the events are independent the probability of getting neither is $\frac{5}{6}\cdot\frac{12}{13} = \frac{10}{13}$ the prob of not getting neither is 1-$\frac{10}{13} = \frac{3}{13}$
4. C	The probability of picking a certain container is $\frac{1}{2}$. The probability of getting a cherry gumdrop from container 1 is $\frac{1}{2}\cdot\frac{7}{12} = \frac{7}{24}$. The probability of getting a cherry from the 2nd container is $\frac{1}{2}\cdot\frac{8}{15} = \frac{4}{15}$. The probability of getting either is $\frac{7}{24} + \frac{4}{15} = \frac{67}{120}$ → a+b=187
5. A	 The total area is Region 1 + Region 2 Region 2 = one fourth of a circle with radius $\sqrt{2}$ = $\frac{1}{4}\pi\left(\sqrt{2}\right)^2 = \frac{\pi}{2}$ The outside area is Region 1: $4 - \frac{\pi}{2}$. The probability is the ratio. $\frac{4-\frac{\pi}{2}}{4} = \frac{8-\pi}{8}$
6. C	The unseen cards do not effect the probability
7 C	The zero can be in the 2nd column or the 3rd. There are 9*1*9 for the 2nd column and 9*9*1 for the 3rd column. 81+81 = 162
8 A	$P(B\mid A) = \frac{P(A\cap B)}{P(A)}$ $P(A\cap B) = P(B\mid A)P(A)$ = 7/10 * 4/7 = 4/10 = 2/5
9. C	There are 3!=6 ways to rearrange 6-2-1, 3! ways to rearrange 5-3-1, 3 ways to rearrange 5-2-2, 3 ways to rearrange 4-4-1, 6 ways to rearrange 4-3-2 and one way to rearrange 3-3-3 total 6+6+3+3+6+1 = 25 there are 6^3 ways to roll dice prob = 25/216
10. E	The sum of the any row of Pascal's triangle must be of the form 2^n and so must be divisible by 4. The divisibility rule for 4 is that the last two digits must be divisible by 4. None of the solutions have that property.

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11. D	ROYGBIV alphabetized is **BGIORVY**. There are 7*6*5*4 total rearrangements. There are 6*5*4 = 120 for each of these letters. So the answer must start with **G**. 211-120 = 91 G can be used with **BIORVY**. Each of these letters has 5*4=20. GB has 20, GI has 40, GO has 60, GR has 80 and GV contains 91. So we need to use GV** and have 11 more to go. GV** can be used with BIORY, each of which has 4 GVB* leaves 7, GVI leaves 3 GVO + 3 = GVOR
12 A	4! = 120
13 B	This is asking for the number of combinations
14 B	There are 19 perfect squares in the first 400 numbers. 2^2, 3^2, …, 20^2 = 400. So we must remove 19 numbers from the list. There are 7 perfect cubes 2^3=8,…,7^3=343 but 64 is both a perfect cube AND a perfect square so we remove 6 more numbers from the list. There are 19+6 = 25 missing numbers <= 400. Since the list starts at 2, Total-25 = 400: 425
15. D	Since there are 2 L's, 2 S's and 3 E' → $\frac{10!}{2!2!3!} = \frac{10!}{4!}$
16 C	We get the expected value by weighing each value by its probability and summing Your chance of getting 3 matches is $\left(\frac{1}{6}\right)^3 = \frac{1}{216}$ expected payoff is $3 \cdot \frac{1}{216} = \frac{3}{216}$ Matching 2: $\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{5}{6} = \frac{5}{216}$, this can happen 11x,1x1,x11 so $\frac{15}{216} \cdot 2 = \frac{30}{216}$ Matching 1: $\frac{1}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} = \frac{25}{216}$ this can happened three ways 1xx, x1x, xx1 so $\frac{75}{216} \cdot 1 = \frac{75}{216}$ Matching 0: $\frac{5}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} = \frac{125}{216}$ you LOSE $1 so $-\frac{125}{216}$ Expected value is the sum: $\frac{3}{216} + \frac{30}{216} + \frac{75}{216} - \frac{125}{216} = -0.7870 \approx -.08$ So for a dollar bet you would expect to receive $0.92
17 A	A player is most likely to be attracted to a game like this, if he thinks he can win. Excitement is generated if he sees a lot of winning. The **VARIABILITY** of the results of this game causes a lot of money to change hands. The variability helps disguise the fact that the player tends to lose. The operator needs to make money. The operator wants an **Expected Value** in his favor so that he can be sure that if a lot of games are played, the money will most like move in his direction. The operator expects to average 8 cents per game.
18 A	14 + 20 + 13 – 8 – 10 – 5 + x = Class 24 + x = Class x/(24 + x) = 1/7 → 7x = 24 + x → 6x = 24 → x = 4 → Class Size = 28 Sum of digits is 10
19 D	if the cardinality of a finite set S is *n*, then the cardinality of the Power Set of S is 2^n $2^5 = 32$
20 D	Infinite Geometric Series: Prob of plays in order Joe: 1/6 Bob 5/6*1/6 Saul 5/6*5/6*1/6 Joe 5/6*5/6*5/6*1/6, Bob 5/6*5/6*5/6*5/6*1/6, Saul 5/6*5/6*5/6*5/6*5/6*1/6 Saul's pattern is 5/6*5/6*1/6, (5/6)^3 * (5/6*5/6*1/6) so a= (5/6*5/6*1/6) and r = (5/6)^3 sum = a/(1-r) → (5/6*5/6*1/6)/(1-(5/6(^3) = 25/91
21 C	Consider a set of 15 1's and 4 +'s. There are 19 = 15+4 symbols and we want to find all the ways to place the +'s. The problem reduces to 19 choose 4.

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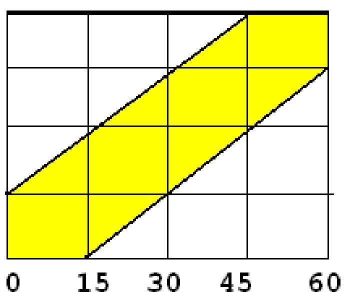
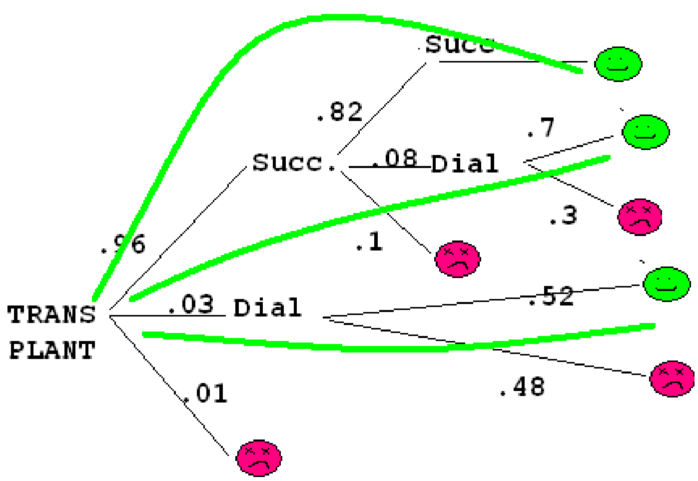
22 B	${}_nC_4 = 5\left({}_nC_5\right) \quad \frac{n!}{4!(n-4)!} = \frac{5n!}{5!(n-5)!} \quad \frac{\cancel{n}!}{\cancel{4}!(n-4)!} = \frac{\cancel{5}\,\cancel{n}!}{\cancel{5}\,\cancel{4}!(n-5)!} \quad \frac{1}{(n-4)(n-5)!} = \frac{1}{(n-5)!}$ n-4 = 1 n=5
23 B	If the odds of winning are 3 to 8, the probability is 3/(8+3) = 3/11. The other players probability is 8/11
24 C	This is the famous Monty Hall problem. As hard as it is to believe, the proper strategy is to switch. You chance of winning increases to 2/3
25. A	$\frac{-\frac{1}{3}\cdot-\frac{4}{3}\cdot-\frac{7}{3}}{1\cdot2\cdot3}(8y)^{-\frac{10}{3}}(-3x)^3$ coefficient $\frac{4\cdot7}{3^3\cdot2\cdot3}2^{-10}(3)^3 \quad \frac{4\cdot7}{2\cdot3\cdot2^{10}} = \frac{7}{3\cdot2^9} = \frac{7}{1536}$
26. B	${}_8C_3\cdot{}_8C_5 \; \frac{8!}{3!5!}\cdot\frac{8!}{5!3!} = \left(\frac{8\cdot7\cdot6}{1\cdot2\cdot3}\right)^2 = 56^2 = 3136$
27. C	A = 5! B = 4! C=4!/2 A/B + B/C = 5!/4! + 4!/(4!/2) = 5 + 2 = 7
28 B	Solve this one geometrically. Your arrival times can be modeled by  The shaded region represent the times when you might meet. The area of the total box is 60^2, the area of the triangles are $\frac{45^2}{2}$ So the probability of falling into the shaded area is $\frac{60^2-45^2}{60^2} = \frac{15^2}{15^2}\cdot\frac{4^2-3^2}{4^2} = \frac{7}{16}$
29 E	No event can be mutually exclusive AND independent.
30 A	 There are 3 paths to survival .96*.82 .96 * .08 * .7 and .03 * .52 The probability of survival is the sum if these terms