



## Executive Summary: 2024 PBA String Pin Report

**Topic:** Evaluation of QAMF Edge String pin machines (USBC-Approved version) and their suitability for Professional Bowlers Association (PBA) competition.

### I. Background

Early in 2024, several bowling centers equipped with the new USBC-Approved QAMF string pin machines expressed interest in joining the PBA Regional Tour. The USBC (United States Bowling Congress) approved certain string pin machines starting August 1, 2023, additionally, they determined that scores and averages on these systems do not require adjustments compared to traditional free-fall pinsetters. However, not all string pin machines are certified/Approved; only those with strings of at least 54 inches in length meet the USBC standards. A link to the USBC studies can be found here;

<https://bowl.com/equipment-specifications/string-pinsetter-research>

**Objective:** The PBA conducted a series of tests to determine if these certified string pin machines could maintain the integrity of professional-level play.

### II. Differences Between Free-Fall and String Pin Machines

- **Free-Fall Machines:** Pins are placed freely on the lane and knocked down without any attachments.
- **String Pin Machines:** Pins are connected to strings that are used to reset the pins. USBC-Approved string pin machines use longer strings (54 inches) to simulate free-fall action while minimizing tangles (breakdowns).

#### Key Considerations:

- Strings on string pin machines can affect pinfall dynamics, potentially affecting scoring.
- Approved string pin machines aim to closely replicate free-fall conditions but may behave differently under certain conditions.

### III. Testing Process and Key Findings

#### Testing Locations:

- Conducted at three bowling centers: Lehigh Lanes (FL), EZ Bowl (IN), and Foxx View Lanes (WI).
- Tests also included different lane patterns and a range of PBA-level bowlers.

#### Data Analysis:

- Lanetalk technology was utilized to gather data from 2024 PBA national tour events on free-fall machines.
- Scoring was not directly compared between the 2 types since it can be easily influenced with lane patterns and other scoring factors.
- Key metrics analyzed included:
  - First-ball shot outcomes
  - Leave rates (e.g., corner pins, splits)
  - Spare conversion percentages
- Videos and surveys were also reviewed.

#### Findings:

1. **Strike and Spare Rates:**
  - The strike percentage on QAMF string pin machines was 48.52%, compared to 57.62% on the national tour (free-fall machines).
  - Higher rev-rate players noted fewer "messenger" pins on string machines, requiring bowlers to hit higher in the pocket for consistent pin carry.
2. **Impact of High-Speed Bowling:**
  - A specific test with a bowler throwing at speeds of 27-30 mph confirmed that increased speed did not result in higher scores. The average score using high-speed techniques was lower (205) than the bowler's previous regional average (215).
3. **Scoring Fairness:**
  - No significant advantage was found for specific styles (e.g., high rev, two-handed techniques).
  - Players needed to adjust to the difference in pin action but generally found the machines to be fair.
4. **Pin Respotting and Out-of-Range Issues:**
  - String machines automatically reset pins to their original positions, unlike free-fall machines that may have more nuanced handling of out-of-range pins.
  - The PBA will follow USBC rules for handling these situations.
5. **Surveys and Player Feedback:**
  - Surveys conducted with participants showed that 91% of bowlers would be willing to compete in PBA events on USBC-Approved string pin machines.
  - Very few re-racks (5 in over 1,350 games) were reported, suggesting improved speed of play.

## IV. Technical Challenges and Solutions

- **Mode Switching:** During early tests, issues arose when string pin machines were accidentally set to "recreational mode" instead of "USBC-Approved mode." The recreational mode has shorter strings (46 inches), which led to more unique pinfall scenarios. The manufacturer has since implemented a display feature showing the current mode on center desks. They also plan to add this feature to lane monitors.
- **Maintenance Observations:**
  - Approved mode requires someone on-site to handle tangles, especially with high-speed play, though a full-time mechanic is not necessary.
  - The machines eliminate deadwood and out-of-range delays, contributing to faster gameplay.

## V. Conclusion and Recommendations

The PBA's tests and data analysis have determined that USBC-Approved QAMF Edge String pin machines are acceptable for professional-level competition. The machines maintain the integrity of the sport while offering benefits like reduced maintenance and increased efficiency.

### Next Steps:

- **Integration:** QAMF Edge String pin machines in USBC-Approved mode can be utilized in PBA Tour events. For 2025, we have several PBA Regional tournaments planned. There are no title events currently scheduled for the PBA National Tour.
- **Further Testing:** The PBA may conduct additional evaluations of other certified string pin machines in the future to ensure consistency.

**Final Statement:** QAMF Edge String pin machines meet the PBA's standards for fairness and competition. They do not pose a significant advantage or disadvantage to any style of play and are deemed a viable option for professional events.

## Appendices

- **Appendix A:** Links to live-stream videos and key moments from test events.
- **Appendix B:** Summary of survey results from participants.
- **Appendix C:** Detailed statistical data comparing string pin machines to free-fall systems.

## **Appendix A**

### **Video links.**

Reminder that you can get fortunate on any pinsetter;

<https://youtu.be/SiDd-IL6nJg?si=VujtaP2M6KZtpPNr>

Links to String pin Regional events;

#### **Foxx View Lanes – Waukesha, WI**

<https://www.youtube.com/watch?v=SpeUM55OzsQ&list=PLwuUW8zaol88HyC44YxltYl34KBNT17w-&index=1>

<https://www.youtube.com/watch?v=0uuCJE8JDgs>

<https://www.youtube.com/watch?v=NjlA23xCVAE>

<https://www.youtube.com/watch?v=ujTYZmRFtdA>

<https://www.youtube.com/watch?v=4lyaffDqL8s>

#### **EZ Bowl - Bluffton, IN**

<https://www.youtube.com/watch?v=HmG9YKAWIM0&t=28s>

<https://www.youtube.com/watch?v=T9GmpsjuM4M>

<https://www.youtube.com/watch?v=xUF2Jn9qFvQ>

#### **Lehigh Lanes – Lehigh Acres, FL**

<https://www.youtube.com/watch?v=Q4UAe3EwFe4>

<https://www.youtube.com/watch?v=j8A0UiK8jpg>

<https://www.youtube.com/watch?v=MDHtxSTGUFO>

## **Appendix B**

### **Key Findings from the 2024 String pin Surveys**

The surveys conducted among participants in the 2024 string pin test events revealed the following insights:

1. **Willingness to Compete:**
  - **91%** of respondents said they would participate in an event that awards a PBA title using string pin machines.
2. **Re-racks and Dead-Wood Issues:**
  - **7%** reported needing a re-rack (once). 5 in over 1,350 games.
  - **0%** encountered dead-wood issues.
3. **Impact of Strings on Pinfall:**
  - Strings could both **aid** in pinfall (e.g., a string knocking down a pin from above) and **hinder** it (e.g., strings preventing a messenger pin from hitting another pin).
4. **Perception of Difficulty:**
  - **68%** felt that achieving strikes was more challenging on string pin machines compared to traditional free-fall machines.
5. **Quotes from PBA Members:**
  - “The string pins certainly gave me more instant and accurate feedback on how my balls energy was being used. Wrong energy usage was much more obvious to me.”
  - “Corner pins don’t always carry as well. Especially if you don’t go high flush.”
  - “Biggest thing is that corners are more prevalent and carry is just slightly harder in general”
  - “The strings do cause some interference in both striking and spare conversions. This is true for all players but in my opinion this is still is a fair playing field as every player has the same chance of filling frames.”
  - “Look at the finals of each event. The best still rise to the top.”
    1. Walter Ray Williams Jr def Ryan Shafer in FL
    2. Kyle Troup def EJ Tackett in IN
    3. EJ Tackett def Marshall Kent in WI

## Appendix C

### Data Comparison - PBA National Tour vs. String pin Tests (2024)

#### Free-fall vs. String pin Machines

Below is a comparison of key metrics between free-fall pinsetters (PBA National Tour) and string pin machines (test events):

1. **Strike Percentage:**
  - Free-fall: **57.62%**
  - String pin: **48.52%**
2. **Most Common Non-Strike Leave:**
  - Free-fall: **10-pin (21.92%)**
  - String pin: **10-pin (20.08%)**
3. **Overall Spare Conversion Rate:**
  - Free-fall: **75.69%**
  - String pin: **69.91%**
4. **Notable Leave & Spare Rates:**
  - **7-10 split:**
    - Leave rate: 1.70% (Free-fall) vs. 1.16% (String pin)
    - Conversion rate: 0.94% (Free-fall) vs. 0.00% (String pin)
  - **2-10 split:**
    - Leave rate: 1.77% (Free-fall) vs. 1.43% (String pin)
    - Conversion rate: 21.18% (Free-fall) vs. 16.00% (String pin)
  - **1-2-4-10 washout:**
    - Leave rate: 0.47% (Free-fall) vs. 0.94% (String pin)
    - Conversion rate: 30.23% (Free-fall) vs. 27.27% (String pin)
5. **Unique Observations:**
  - **2-8-10 split:**
    - Leave rate: 1.62% (Free-fall) vs. 1.24% (String pin)
    - Conversion rate: 0.74% (Free-fall) vs. 2.30% (String pin)
  - This higher conversion rate on string pin machines may indicate a slight advantage, though it could be a statistical anomaly. The conversion rate on other splits do not show this variance.
6. **Anomalies in National Tour Data:**
  - A disproportionately high number of **1-pin leaves** were recorded in the national tour data due to manual corrections of scores (e.g., adjusting a mistakenly marked strike to a nine-count). Thus, the high frequency of recorded 1-pin leaves may not be accurate.
7. **Considerations on Data Comparison:**
  - The PBA National Tour includes the most elite bowlers, leading to higher strike and spare percentages. Therefore, while comparisons with regional and PBA50 data are insightful, we should consider the skill gap between these groups.

<b>PBA National Tour</b>							<b>PBA Stringpin Totals</b>					
<b>Pins</b>	<b>Pinleaves</b>	<b>Pinleaves %</b>	<b>Converted</b>	<b>Missed</b>	<b>Converted%</b>		<b>Pins</b>	<b>Pinleaves</b>	<b>Pinleaves %</b>	<b>Converted</b>	<b>Missed</b>	<b>Converted%</b>
10	16389	21.92%	15,582	807	95.08%		10	1403	20.08%	1242	161	88.52%
7	7415	9.92%	7,031	384	94.82%		7	487	6.97%	433	54	88.91%
4	4495	6.01%	4,368	127	97.17%		4	644	9.22%	598	46	92.86%
9	3305	4.42%	3,223	82	97.52%		9	190	2.72%	175	15	92.11%
2	2850	3.81%	2,768	82	97.12%		2	304	4.35%	275	29	90.46%
6	2622	3.51%	2,534	88	96.64%		6	219	3.13%	201	18	91.78%
3-6-10	2546	3.40%	2,045	501	80.32%		3-6-10	325	4.65%	228	97	70.15%
6-10	1869	2.50%	1,708	161	91.39%		6-10	208	2.98%	180	28	86.54%
2-8	1744	2.33%	1,438	306	82.45%		2-8	185	2.65%	155	30	83.78%
3	1599	2.14%	1,558	41	97.44%		3	169	2.42%	156	13	92.31%
8	1531	2.05%	1,483	48	96.86%		8	65	0.93%	60	5	92.31%
3-6	1465	1.96%	1,314	151	89.69%		3-6	163	2.33%	138	25	84.66%
2-10	1327	1.77%	281	1,046	21.18%		2-10	100	1.43%	16	84	16.00%
7-10	1272	1.70%	12	1,260	0.94%		7-10	81	1.16%	0	81	0.00%
4-7	1270	1.70%	1,185	85	93.31%		4-7	149	2.13%	127	22	85.23%
2-8-10	1209	1.62%	9	1,200	0.74%		2-8-10	87	1.24%	2	85	2.30%
3-10	820	1.10%	473	347	57.68%		3-10	122	1.75%	73	49	59.84%
2-4	801	1.07%	720	81	89.89%		2-4	52	0.74%	39	13	75.00%
3-6-9-10	782	1.05%	484	298	61.89%		3-6-9-10	71	1.02%	38	33	53.52%
5	697	0.93%	672	25	96.41%		5	66	0.94%	61	5	92.42%
2-4-8-10	687	0.92%	67	620	9.75%		2-4-8-10	24	0.34%	4	20	16.67%
2-4-10	657	0.88%	128	529	19.48%		2-4-10	109	1.56%	13	96	11.93%
3-9	626	0.84%	515	111	82.27%		3-9	41	0.59%	30	11	73.17%
2-4-8	622	0.83%	463	159	74.44%		2-4-8	29	0.41%	23	6	79.31%
4-6-7	605	0.81%	4	601	0.66%		4-6-7	48	0.69%	1	47	2.08%
2-4-7	539	0.72%	409	130	75.88%		2-4-7	53	0.76%	34	19	64.15%
4-6-7-10	530	0.71%	2	528	0.38%		4-6-7-10	66	0.94%	1	65	1.52%
4-9	490	0.66%	86	404	17.55%		4-9	87	1.24%	12	75	13.79%
2-4-5-8	454	0.61%	347	107	76.43%		2-4-5-8	45	0.64%	25	20	55.56%
4-10	453	0.61%	25	428	5.52%		4-10	65	0.93%	1	64	1.54%
1-2-4	451	0.60%	349	102	77.38%		1-2-4	72	1.03%	56	16	77.78%

1-2-4-6-10	439	0.59%	134	305	30.52%		1-2-4-6-10	64	0.92%	18	46	28.13%
3-4-6-7	412	0.55%	70	342	16.99%		3-4-6-7	45	0.64%	7	38	15.56%
2-4-5	398	0.53%	339	59	85.18%		2-4-5	97	1.39%	75	22	77.32%
4-7-10	371	0.50%	24	347	6.47%		4-7-10	102	1.46%	5	97	4.90%
6-9-10	365	0.49%	324	41	88.77%		6-9-10	11	0.16%	11	0	100.00%
1-2-4-10	354	0.47%	107	247	30.23%		1-2-4-10	66	0.94%	18	48	27.27%
8-10	351	0.47%	6	345	1.71%		8-10	14	0.20%	0	14	0.00%
1-2	350	0.47%	327	23	93.43%		1-2	14	0.20%	12	2	85.71%
3-6-7-10	332	0.44%	90	242	27.11%		3-6-7-10	42	0.60%	6	36	14.29%
2-7	325	0.43%	197	128	60.62%		2-7	25	0.36%	12	13	48.00%
4-6-10	320	0.43%	2	318	0.62%		4-6-10	14	0.20%	0	14	0.00%
3-4-6-7-10	303	0.41%	52	251	17.16%		3-4-6-7-10	45	0.64%	8	37	17.78%
4-6	297	0.40%	1	296	0.34%		4-6	9	0.13%	0	9	0.00%
4-8	288	0.39%	247	41	85.76%		4-8	8	0.11%	6	2	75.00%
1-2-3-4-5-6-7	282	0.38%	132	150	46.81%		1-2-3-4-5-6-7	18	0.26%	5	13	27.78%
4-6-7-9-10	273	0.37%	6	267	2.20%		4-6-7-9-10	1	0.01%	0	1	0.00%
1	268*	0.36%	256	12	95.52%		1	2	0.03%	1	1	50.00%
2-5	262	0.35%	235	27	89.69%		2-5	45	0.64%	39	6	86.67%
1-2-8	258	0.35%	205	53	79.46%		1-2-8	37	0.53%	28	9	75.68%
3-6-9	252	0.34%	187	65	74.21%		3-6-9	5	0.07%	3	2	60.00%
6-7-10	251	0.34%	18	233	7.17%		6-7-10	51	0.73%	3	48	5.88%
3-7	234	0.31%	48	186	20.51%		3-7	10	0.14%	3	7	30.00%
1-2-8-10	216	0.29%	68	148	31.48%		1-2-8-10	42	0.60%	10	32	23.81%
1-2-4-8	204	0.27%	158	46	77.45%		1-2-4-8	61	0.87%	48	13	78.69%
3-7-9	194	0.26%	1	193	0.52%		3-7-9	9	0.13%	0	9	0.00%
2-4-7-8	191	0.26%	119	72	62.30%		2-4-7-8	8	0.11%	6	2	75.00%
6-7	186	0.25%	7	179	3.76%		6-7	7	0.10%	0	7	0.00%
1-2-10	176	0.24%	63	113	35.80%		1-2-10	21	0.30%	10	11	47.62%
2-4-6-10	172	0.23%	29	143	16.86%		2-4-6-10	15	0.21%	1	14	6.67%
3-6-7	170	0.23%	30	140	17.65%		3-6-7	10	0.14%	2	8	20.00%
3-5-6-9	159	0.21%	112	47	70.44%		3-5-6-9	7	0.10%	6	1	85.71%
3-5-6	137	0.18%	119	18	86.86%		3-5-6	12	0.17%	10	2	83.33%
6-8	135	0.18%	13	122	9.63%		6-8	8	0.11%	2	6	25.00%
3-4-6-7-9-10	134	0.18%	9	125	6.72%		3-4-6-7-9-10	0	0.00%	0	0	#DIV/0!



6-9	133	0.18%	123	10	92.48%		6-9	16	0.23%	15	1	93.75%
1-2-4-7	130	0.17%	101	29	77.69%		1-2-4-7	14	0.20%	10	4	71.43%
1-3-6	127	0.17%	104	23	81.89%		1-3-6	16	0.23%	10	6	62.50%
1-3-4-6-7	108	0.14%	39	69	36.11%		1-3-4-6-7	5	0.07%	2	3	40.00%
3-9-10	107	0.14%	38	69	35.51%		3-9-10	1	0.01%	0	1	0.00%
1-3-9	101	0.14%	76	25	75.25%		1-3-9	5	0.07%	4	1	80.00%
3-6-7-9	99	0.13%	8	91	8.08%		3-6-7-9	1	0.01%	0	1	0.00%
7-9	96	0.13%	1	95	1.04%		7-9	2	0.03%	0	2	0.00%
3-5	88	0.12%	81	7	92.05%		3-5	5	0.07%	4	1	80.00%
1-3-6-7	87	0.12%	21	66	24.14%		1-3-6-7	7	0.10%	1	6	14.29%
5-9	84	0.11%	76	8	90.48%		5-9	15	0.21%	11	4	73.33%
2-7-8	84	0.11%	33	51	39.29%		2-7-8	2	0.03%	2	0	100.00%
1-3-6-9	82	0.11%	62	20	75.61%		1-3-6-9	15	0.21%	8	7	53.33%
4-6-7-8-10	80	0.11%	2	78	2.50%		4-6-7-8-10	1	0.01%	0	1	0.00%
1-2-6-10	78	0.10%	25	53	32.05%		1-2-6-10	7	0.10%	0	7	0.00%
5-7	75	0.10%	16	59	21.33%		5-7	15	0.21%	3	12	20.00%
3-4-6-10	75	0.10%	17	58	22.67%		3-4-6-10	6	0.09%	1	5	16.67%
2-4-7-10	75	0.10%	22	53	29.33%		2-4-7-10	10	0.14%	0	10	0.00%
1-3	75	0.10%	66	9	88.00%		1-3	10	0.14%	7	3	70.00%
4-7-9	71	0.09%	12	59	16.90%		4-7-9	10	0.14%	1	9	10.00%
2-5-8	70	0.09%	45	25	64.29%		2-5-8	8	0.11%	7	1	87.50%
3-4-7	67	0.09%	9	58	13.43%		3-4-7	7	0.10%	2	5	28.57%
4-7-8	65	0.09%	53	12	81.54%		4-7-8	2	0.03%	1	1	50.00%
4-8-10	62	0.08%	9	53	14.52%		4-8-10	4	0.06%	0	4	0.00%
1-2-3-4-5-7-8	61	0.08%	36	25	59.02%		1-2-3-4-5-7-8	0	0.00%	0	0	#DIV/0!
5-10	54	0.07%	16	38	29.63%		5-10	6	0.09%	0	6	0.00%
2-4-6-7-10	53	0.07%	8	45	15.09%		2-4-6-7-10	3	0.04%	0	3	0.00%
9-10	50	0.07%	20	30	40.00%		9-10	2	0.03%	0	2	0.00%
1-3-7-9	49	0.07%	11	38	22.45%		1-3-7-9	7	0.10%	0	7	0.00%
3-4-7-10	47	0.06%	8	39	17.02%		3-4-7-10	22	0.31%	3	19	13.64%
3-4-6	41	0.05%	9	32	21.95%		3-4-6	2	0.03%	0	2	0.00%
1-3-7	40	0.05%	18	22	45.00%		1-3-7	2	0.03%	0	2	0.00%
1-2-7	39	0.05%	31	8	79.49%		1-2-7	4	0.06%	3	1	75.00%
1-2-6-8-10	39	0.05%	13	26	33.33%		1-2-6-8-10	6	0.09%	0	6	0.00%

5-8	38	0.05%	35	3	92.11%		5-8	4	0.06%	4	0	100.00%
3-4-10	37	0.05%	9	28	24.32%		3-4-10	3	0.04%	2	1	66.67%
2-4-5-7	36	0.05%	32	4	88.89%		2-4-5-7	4	0.06%	2	2	50.00%
3-4	35	0.05%	7	28	20.00%		3-4	4	0.06%	0	4	0.00%
1-3-6-10	27	0.04%	14	13	51.85%		1-3-6-10	3	0.04%	2	1	66.67%
1-2-5	27	0.04%	20	7	74.07%		1-2-5	2	0.03%	1	1	50.00%
4-6-9-10	26	0.03%	0	26	0.00%		4-6-9-10	0	0.00%	0	0	#DIV/0!
2-4-6-7-8-10	23	0.03%	3	20	13.04%		2-4-6-7-8-10	0	0.00%	0	0	#DIV/0!
2-4-5-7-8	23	0.03%	7	16	30.43%		2-4-5-7-8	0	0.00%	0	0	#DIV/0!
1-3-4-7	23	0.03%	6	17	26.09%		1-3-4-7	1	0.01%	0	1	0.00%
2-4-6-7	22	0.03%	5	17	22.73%		2-4-6-7	0	0.00%	0	0	#DIV/0!
6-8-10	21	0.03%	6	15	28.57%		6-8-10	0	0.00%	0	0	#DIV/0!
3-5-9	20	0.03%	13	7	65.00%		3-5-9	0	0.00%	0	0	#DIV/0!
4-6-7-9	19	0.03%	0	19	0.00%		4-6-7-9	0	0.00%	0	0	#DIV/0!
2-5-7	19	0.03%	8	11	42.11%		2-5-7	0	0.00%	0	0	#DIV/0!
1-2-4-8-10	18	0.02%	4	14	22.22%		1-2-4-8-10	0	0.00%	0	0	#DIV/0!
2-7-10	17	0.02%	3	14	17.65%		2-7-10	0	0.00%	0	0	#DIV/0!
1-5	17	0.02%	14	3	82.35%		1-5	2	0.03%	2	0	100.00%
1-3-6-8-10	16	0.02%	9	7	56.25%		1-3-6-8-10	3	0.04%	3	0	100.00%
1-10	16	0.02%	3	13	18.75%		1-10	1	0.01%	1	0	100.00%
2-6-10	15	0.02%	0	15	0.00%		2-6-10	0	0.00%	0	0	#DIV/0!
1-3-8	15	0.02%	11	4	73.33%		1-3-8	0	0.00%	0	0	#DIV/0!
1-2-6-7-8-10	15	0.02%	0	15	0.00%		1-2-6-7-8-10	0	0.00%	0	0	#DIV/0!
3-7-10	13	0.02%	2	11	15.38%		3-7-10	0	0.00%	0	0	#DIV/0!
1-2-7-8-10	13	0.02%	4	9	30.77%		1-2-7-8-10	3	0.04%	0	3	0.00%
6-7-9-10	12	0.02%	2	10	16.67%		6-7-9-10	1	0.01%	0	1	0.00%
4-6-9	12	0.02%	0	12	0.00%		4-6-9	1	0.01%	0	1	0.00%
4-5	12	0.02%	3	9	25.00%		4-5	3	0.04%	1	2	33.33%
1-2-3-5-6-9-1	12	0.02%	8	4	66.67%		1-2-3-5-6-9-1	5	0.07%	3	2	60.00%
1-2-3-4-5-7	11	0.01%	7	4	63.64%		1-2-3-4-5-7	0	0.00%	0	0	#DIV/0!
7-8	10	0.01%	4	6	40.00%		7-8	2	0.03%	0	2	0.00%
1-4-5-7-8	10	0.01%	2	8	20.00%		1-4-5-7-8	1	0.01%	1	0	100.00%
1-2-3-4-5-7-8	10	0.01%	2	8	20.00%		1-2-3-4-5-7-8	1	0.01%	0	1	0.00%
1-2-3-4-5	10	0.01%	7	3	70.00%		1-2-3-4-5	0	0.00%	0	0	#DIV/0!

3-5-10	9	0.01%	7	2	77.78%		3-5-10	0	0.00%	0	0	#DIV/0!
1-8	9	0.01%	6	3	66.67%		1-8	0	0.00%	0	0	#DIV/0!
1-2-6-8	9	0.01%	1	8	11.11%		1-2-6-8	1	0.01%	0	1	0.00%
1-2-3	9	0.01%	2	7	22.22%		1-2-3	0	0.00%	0	0	#DIV/0!
1-7	8	0.01%	3	5	37.50%		1-7	0	0.00%	0	0	#DIV/0!
1-5-7-8	8	0.01%	3	5	37.50%		1-5-7-8	0	0.00%	0	0	#DIV/0!
1-2-7-10	8	0.01%	2	6	25.00%		1-2-7-10	0	0.00%	0	0	#DIV/0!
1-2-3-4	8	0.01%	4	4	50.00%		1-2-3-4	0	0.00%	0	0	#DIV/0!
6-7-9	7	0.01%	0	7	0.00%		6-7-9	0	0.00%	0	0	#DIV/0!
5-6	7	0.01%	1	6	14.29%		5-6	2	0.03%	0	2	0.00%
4-6-8-10	7	0.01%	0	7	0.00%		4-6-8-10	0	0.00%	0	0	#DIV/0!
2-6-7-10	7	0.01%	1	6	14.29%		2-6-7-10	1	0.01%	0	1	0.00%
2-5-7-8	7	0.01%	3	4	42.86%		2-5-7-8	0	0.00%	0	0	#DIV/0!
1-2-5-9	7	0.01%	5	2	71.43%		1-2-5-9	1	0.01%	0	1	0.00%
4-6-7-8	6	0.01%	0	6	0.00%		4-6-7-8	0	0.00%	0	0	#DIV/0!
3-5-6-9-10	6	0.01%	3	3	50.00%		3-5-6-9-10	0	0.00%	0	0	#DIV/0!
1-3-7-9-10	6	0.01%	2	4	33.33%		1-3-7-9-10	0	0.00%	0	0	#DIV/0!
1-3-4-7-9	6	0.01%	1	5	16.67%		1-3-4-7-9	1	0.01%	0	1	0.00%
1-3-10	6	0.01%	4	2	66.67%		1-3-10	0	0.00%	0	0	#DIV/0!
4-7-9-10	5	0.01%	1	4	20.00%		4-7-9-10	1	0.01%	0	1	0.00%
3-4-6-9-10	5	0.01%	0	5	0.00%		3-4-6-9-10	0	0.00%	0	0	#DIV/0!
2-6	5	0.01%	0	5	0.00%		2-6	0	0.00%	0	0	#DIV/0!
2-4-6	5	0.01%	2	3	40.00%		2-4-6	0	0.00%	0	0	#DIV/0!
1-6-10	5	0.01%	3	2	60.00%		1-6-10	1	0.01%	0	1	0.00%
1-5-7	5	0.01%	4	1	80.00%		1-5-7	0	0.00%	0	0	#DIV/0!
1-4	5	0.01%	5	0	100.00%		1-4	0	0.00%	0	0	#DIV/0!
1-3-5	5	0.01%	3	2	60.00%		1-3-5	1	0.01%	0	1	0.00%
1-2-9	5	0.01%	4	1	80.00%		1-2-9	4	0.06%	4	0	100.00%
1-2-4-6-7-10	5	0.01%	2	3	40.00%		1-2-4-6-7-10	0	0.00%	0	0	#DIV/0!
5-6-10	4	0.01%	0	4	0.00%		5-6-10	0	0.00%	0	0	#DIV/0!
4-7-8-10	4	0.01%	0	4	0.00%		4-7-8-10	0	0.00%	0	0	#DIV/0!
1-3-8-10	4	0.01%	2	2	50.00%		1-3-8-10	2	0.03%	1	1	50.00%
1-3-6-7-9	4	0.01%	0	4	0.00%		1-3-6-7-9	0	0.00%	0	0	#DIV/0!
1-2-5-8-9	4	0.01%	3	1	75.00%		1-2-5-8-9	2	0.03%	2	0	100.00%

1-2-3-5-6-10	4	0.01%	1	3	25.00%		1-2-3-5-6-10	0	0.00%	0	0	#DIV/0!
4-9-10	3	0.00%	0	3	0.00%		4-9-10	0	0.00%	0	0	#DIV/0!
4-5-7	3	0.00%	0	3	0.00%		4-5-7	14	0.20%	4	10	28.57%
3-8	3	0.00%	1	2	33.33%		3-8	0	0.00%	0	0	#DIV/0!
3-6-7-9-10	3	0.00%	0	3	0.00%		3-6-7-9-10	1	0.01%	0	1	0.00%
3-5-6-10	3	0.00%	1	2	33.33%		3-5-6-10	1	0.01%	0	1	0.00%
3-4-9	3	0.00%	1	2	33.33%		3-4-9	0	0.00%	0	0	#DIV/0!
2-7-8-10	3	0.00%	1	2	33.33%		2-7-8-10	0	0.00%	0	0	#DIV/0!
2-6-7	3	0.00%	1	2	33.33%		2-6-7	0	0.00%	0	0	#DIV/0!
1-4-7	3	0.00%	0	3	0.00%		1-4-7	0	0.00%	0	0	#DIV/0!
1-3-6-8	3	0.00%	0	3	0.00%		1-3-6-8	1	0.01%	0	1	0.00%
1-3-5-10	3	0.00%	1	2	33.33%		1-3-5-10	1	0.01%	0	1	0.00%
1-3-4-9	3	0.00%	1	2	33.33%		1-3-4-9	0	0.00%	0	0	#DIV/0!
1-2-3-5-7-10	3	0.00%	2	1	66.67%		1-2-3-5-7-10	0	0.00%	0	0	#DIV/0!
1-2-3-5-7	3	0.00%	3	0	100.00%		1-2-3-5-7	0	0.00%	0	0	#DIV/0!
1-2-3-4-5-6-7	3	0.00%	0	3	0.00%		1-2-3-4-5-6-7	0	0.00%	0	0	#DIV/0!
5-8-10	2	0.00%	1	1	50.00%		5-8-10	0	0.00%	0	0	#DIV/0!
4-6-8	2	0.00%	0	2	0.00%		4-6-8	0	0.00%	0	0	#DIV/0!
3-6-8-10	2	0.00%	0	2	0.00%		3-6-8-10	0	0.00%	0	0	#DIV/0!
3-5-9-10	2	0.00%	1	1	50.00%		3-5-9-10	1	0.01%	0	1	0.00%
3-4-6-7-9	2	0.00%	0	2	0.00%		3-4-6-7-9	0	0.00%	0	0	#DIV/0!
2-5-10	2	0.00%	0	2	0.00%		2-5-10	0	0.00%	0	0	#DIV/0!
2-4-5-10	2	0.00%	1	1	50.00%		2-4-5-10	0	0.00%	0	0	#DIV/0!
1-6	2	0.00%	1	1	50.00%		1-6	0	0.00%	0	0	#DIV/0!
1-5-9	2	0.00%	0	2	0.00%		1-5-9	0	0.00%	0	0	#DIV/0!
1-5-8	2	0.00%	2	0	100.00%		1-5-8	0	0.00%	0	0	#DIV/0!
1-5-10	2	0.00%	0	2	0.00%		1-5-10	0	0.00%	0	0	#DIV/0!
1-4-5-7-8-10	2	0.00%	0	2	0.00%		1-4-5-7-8-10	0	0.00%	0	0	#DIV/0!
1-3-9-10	2	0.00%	1	1	50.00%		1-3-9-10	0	0.00%	0	0	#DIV/0!
1-3-5-6-10	2	0.00%	0	2	0.00%		1-3-5-6-10	0	0.00%	0	0	#DIV/0!
1-2-8-9	2	0.00%	2	0	100.00%		1-2-8-9	3	0.04%	2	1	66.67%
1-2-7-9	2	0.00%	1	1	50.00%		1-2-7-9	0	0.00%	0	0	#DIV/0!
1-2-6-7-10	2	0.00%	0	2	0.00%		1-2-6-7-10	1	0.01%	0	1	0.00%
1-2-6	2	0.00%	1	1	50.00%		1-2-6	0	0.00%	0	0	#DIV/0!

1-2-4-6	2	0.00%	1	1	50.00%		1-2-4-6	0	0.00%	0	0	#DIV/0!
1-2-4-5	2	0.00%	0	2	0.00%		1-2-4-5	0	0.00%	0	0	#DIV/0!
1-2-3-5-6	2	0.00%	1	1	50.00%		1-2-3-5-6	0	0.00%	0	0	#DIV/0!
8-9-10	1	0.00%	0	1	0.00%		8-9-10	0	0.00%	0	0	#DIV/0!
8-9	1	0.00%	1	0	100.00%		8-9	0	0.00%	0	0	#DIV/0!
7-8-10	1	0.00%	0	1	0.00%		7-8-10	0	0.00%	0	0	#DIV/0!
6-7-8-9-10	1	0.00%	1	0	100.00%		6-7-8-9-10	0	0.00%	0	0	#DIV/0!
6-7-8	1	0.00%	0	1	0.00%		6-7-8	0	0.00%	0	0	#DIV/0!
5-9-10	1	0.00%	0	1	0.00%		5-9-10	0	0.00%	0	0	#DIV/0!
5-7-10	1	0.00%	0	1	0.00%		5-7-10	0	0.00%	0	0	#DIV/0!
5-6-9	1	0.00%	0	1	0.00%		5-6-9	0	0.00%	0	0	#DIV/0!
3-7-9-10	1	0.00%	0	1	0.00%		3-7-9-10	0	0.00%	0	0	#DIV/0!
3-4-8-10	1	0.00%	0	1	0.00%		3-4-8-10	0	0.00%	0	0	#DIV/0!
3-4-7-8-10	1	0.00%	0	1	0.00%		3-4-7-8-10	0	0.00%	0	0	#DIV/0!
2-6-8-10	1	0.00%	0	1	0.00%		2-6-8-10	0	0.00%	0	0	#DIV/0!
2-4-9	1	0.00%	0	1	0.00%		2-4-9	0	0.00%	0	0	#DIV/0!
2-4-7-8-10	1	0.00%	1	0	100.00%		2-4-7-8-10	0	0.00%	0	0	#DIV/0!
2-4-6-9-10	1	0.00%	0	1	0.00%		2-4-6-9-10	0	0.00%	0	0	#DIV/0!
2-4-6-8-10	1	0.00%	0	1	0.00%		2-4-6-8-10	0	0.00%	0	0	#DIV/0!
2-4-6-7-8	1	0.00%	0	1	0.00%		2-4-6-7-8	0	0.00%	0	0	#DIV/0!
2-4-5-8-10	1	0.00%	0	1	0.00%		2-4-5-8-10	0	0.00%	0	0	#DIV/0!
2-3-6-7	1	0.00%	1	0	100.00%		2-3-6-7	0	0.00%	0	0	#DIV/0!
2-3-4-7-10	1	0.00%	0	1	0.00%		2-3-4-7-10	0	0.00%	0	0	#DIV/0!
2-3	1	0.00%	1	0	100.00%		2-3	0	0.00%	0	0	#DIV/0!
1-9-10	1	0.00%	0	1	0.00%		1-9-10	0	0.00%	0	0	#DIV/0!
1-9	1	0.00%	1	0	100.00%		1-9	0	0.00%	0	0	#DIV/0!
1-7-8-10	1	0.00%	0	1	0.00%		1-7-8-10	0	0.00%	0	0	#DIV/0!
1-6-7	1	0.00%	0	1	0.00%		1-6-7	0	0.00%	0	0	#DIV/0!
1-5-8-9	1	0.00%	0	1	0.00%		1-5-8-9	0	0.00%	0	0	#DIV/0!
1-5-7-9	1	0.00%	0	1	0.00%		1-5-7-9	0	0.00%	0	0	#DIV/0!
1-5-6-9-10	1	0.00%	0	1	0.00%		1-5-6-9-10	0	0.00%	0	0	#DIV/0!
1-5-6	1	0.00%	0	1	0.00%		1-5-6	0	0.00%	0	0	#DIV/0!
1-4-8-10	1	0.00%	0	1	0.00%		1-4-8-10	0	0.00%	0	0	#DIV/0!
1-4-5	1	0.00%	1	0	100.00%		1-4-5	0	0.00%	0	0	#DIV/0!

