*Lampiran 15*

**UJI VALIDITAS DAN RELIABILITAS**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NO. | NAMA | 𝑋 | | | | | 𝑌 | 𝑋2 | | | | | 𝑌2 |
| 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 1. | Ahmad Riko Andrianto | 9 | 6 | 6 | 5 | 6 | 30 | 81 | 36 | 36 | 25 | 36 | 900 |
| 2. | Arum Tis Anata | 9 | 6 | 6 | 6 | 8 | 35 | 81 | 36 | 36 | 36 | 64 | 1225 |
| 3. | Baity Jannati Ramadhani | 10 | 4 | 6 | 6 | 7 | 33 | 100 | 16 | 36 | 36 | 49 | 1089 |
| 4. | Denny Bagus Wahyu S. | 8 | 5 | 6 | 6 | 6 | 31 | 64 | 25 | 36 | 36 | 36 | 961 |
| 5. | Diana Elina Pertiwi | 7 | 5 | 9 | 9 | 7 | 40 | 49 | 25 | 81 | 81 | 49 | 1600 |
| 6. | Dinda Damara | 5 | 5 | 8 | 5 | 7 | 29 | 25 | 25 | 64 | 25 | 49 | 841 |
| 7. | Dwi Sania Noor Azizah | 5 | 5 | 8 | 5 | 6 | 29 | 25 | 25 | 64 | 25 | 36 | 841 |
| 8. | Fauzul Muna | 9 | 6 | 12 | 4 | 7 | 38 | 81 | 36 | 144 | 16 | 49 | 1444 |
| 9. | Layli Riza Nadiyya | 8 | 0 | 7 | 3 | 0 | 18 | 81 | 0 | 49 | 9 | 0 | 324 |
| 10. | Lily Setya Apriliani | 7 | 6 | 7 | 5 | 6 | 31 | 49 | 36 | 49 | 25 | 36 | 961 |
| 11. | Linda Nor Safitri | 6 | 5 | 6 | 6 | 10 | 33 | 36 | 25 | 36 | 36 | 100 | 1089 |
| 12. | Maulida Rahmaniyah | 9 | 0 | 6 | 7 | 4 | 26 | 81 | 0 | 36 | 49 | 16 | 676 |
| 13. | Millenia Artis Shintia | 8 | 5 | 9 | 6 | 9 | 37 | 64 | 25 | 81 | 36 | 81 | 1369 |
| 14. | Muthia Fairuza Khusna | 6 | 5 | 6 | 3 | 6 | 26 | 36 | 25 | 36 | 9 | 36 | 676 |
| 15. | Noor Maulida Khasanah | 8 | 4 | 9 | 5 | 6 | 32 | 64 | 16 | 81 | 25 | 36 | 1024 |
| 16. | Nurissyifa Ramadhani | 5 | 4 | 9 | 7 | 6 | 31 | 25 | 16 | 81 | 49 | 36 | 961 |
| 17. | Pradina Kurnia Sari | 12 | 4 | 10 | 6 | 9 | 41 | 144 | 16 | 100 | 36 | 81 | 1681 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. | Rajwa Habibah Hanum | 11 | 5 | 6 | 6 | 4 | 32 | 121 | 25 | 36 | 36 | 16 | 1024 |
| 19. | Rizqi Lazuardhi | 8 | 4 | 9 | 5 | 7 | 33 | 64 | 16 | 81 | 25 | 49 | 1089 |
| 20. | Rr. Herdian Nur Ayu W. | 8 | 7 | 6 | 5 | 9 | 35 | 64 | 49 | 36 | 25 | 81 | 1225 |
| 21. | Salahuddin Rasyid | 11 | 5 | 6 | 5 | 6 | 33 | 121 | 25 | 36 | 25 | 36 | 1089 |
| 22. | Sarisawati Intishar | 9 | 4 | 6 | 6 | 10 | 35 | 81 | 16 | 36 | 36 | 100 | 1225 |
| 23. | Septina Maula Husna | 12 | 5 | 7 | 8 | 6 | 38 | 144 | 25 | 49 | 64 | 36 | 1444 |
| 24. | Shella Novita S. | 6 | 9 | 7 | 6 | 7 | 35 | 36 | 81 | 49 | 36 | 49 | 1225 |
| 25. | Shinta Kumala Dewi | 12 | 11 | 9 | 10 | 9 | 51 | 144 | 121 | 81 | 100 | 81 | 2601 |
| 26. | Sonya Novita Dewi | 9 | 8 | 9 | 6 | 7 | 39 | 81 | 64 | 81 | 36 | 49 | 1521 |
| 27. | Widiyaningrum | 8 | 6 | 9 | 6 | 7 | 36 | 64 | 36 | 81 | 36 | 49 | 1296 |
| 28. | Wildan Anggita Rivaldi | 12 | 10 | 7 | 7 | 5 | 41 | 144 | 100 | 49 | 49 | 25 | 1681 |
| 29. | Yasmin Noor | 5 | 5 | 8 | 5 | 8 | 31 | 25 | 25 | 64 | 25 | 64 | 961 |
|  | Jumlah | 242 | 154 | 219 | 169 | 195 | 979 | 2168 | 966 | 1740 | 1047 | 1425 | 34043 |
| 𝑘𝑢𝑎𝑑𝑟𝑎𝑡 𝑗𝑢𝑚𝑙𝑎ℎ    𝑛 | 2019,4 | 817,79 | 1653,8 | 984,9 | 1311 |  | | | | | | |
| Varians | 5,1225 | 5,1106 | 2,4542 | 2,143 | 3,924 |
| Jumlah Varians | 18,754 | | | | |
| Varians Total | 34,257 | | | | |

* Uji Validitas

Validitas butir soal dihitung dengan menggunakan rumus korelasi *product moment,* yaitu sebagai berikut.

𝑛 ∑ 𝑋𝑌 − (∑ 𝑋)(∑ 𝑌)

𝑟𝑋𝑌 =

√{𝑁 ∑ 𝑋2 − (∑ 𝑋)2}{𝑁 ∑ 𝑌2 − (∑ 𝑌)2}

(Arikunto, 170)

Keterangan:

𝑟𝑥𝑦 = koefisien korelasi skor butir soal dan skor total

𝑁 = banyaknya subjek

𝛴𝑋 = jumlah skor tiap butir soal

𝛴𝑌 = jumlah skor total butir soal

𝛴𝑋𝑌 = jumlah perkalian skor butir soal dengan skor total

𝛴𝑋2 = jumlah kuadrat skor butir soal

𝛴𝑌2 = jumlah kuadrat skor total

𝑟𝑡𝑎𝑏𝑒𝑙 = 0,367 (sig 5%, 𝑑𝑓 = 𝑛 − 2)

|  |  |  |
| --- | --- | --- |
| No. Soal | 𝑟𝑥𝑦 | Keterangan |
| 1. | 0,39198792 | Soal Valid |
| 2. | 0,72760524 | Soal Valid |
| 3. | 0,41695065 | Soal Valid |
| 4. | 0,47904162 | Soal Valid |
| 5. | 0,41294459 | Soal Valid |

* Uji Reliabilitas

= ( (

= ( (

=

Keterangan

𝑟11 : reliabilitas yang dicari

∑ 𝜎2 : jumlah varians skor tiap-tiap item

𝑖

𝜎2 : varians total

𝑡

𝑛 : banyak butir soal

Rumus yang digunakan untuk menghitung reliabilitas soal bentuk uraian dengan rumus *Alpha*, yaitu sebagai berikut. Rumus alpha (Arikunto, 2009)

Lihat tabel *product moment* dengan taraf signifikansi 5% . Diperoleh 𝑟𝑡𝑎𝑏𝑒𝑙 = 0,367.

𝑟11 > 𝑟𝑡𝑎𝑏𝑒𝑙 sehingga instrumen yang diuji cobakan reliabel.

*Lampiran 16*

#### **ANALISIS DAYA BEDA**

Hasil jawaban siswa kelas uji coba dapat dilihat pada tabel berikut.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Nama | 𝑋 | | | | | 𝑌 |
| 1 | 2 | 3 | 4 | 5 |
| 9. | Subyek 9 | 8 | 0 | 7 | 3 | 0 | 18 |
| 12. | Subyek 12 | 9 | 0 | 6 | 7 | 4 | 26 |
| 7. | Subyek 7 | 5 | 5 | 8 | 5 | 6 | 29 |
| 14. | Subyek 14 | 6 | 5 | 6 | 3 | 6 | 29 |
| 6. | Subyek 9 | 5 | 5 | 8 | 5 | 7 | 30 |
| 4. | Subyek 4 | 8 | 5 | 6 | 6 | 6 | 31 |
| 10. | Subyek 10 | 7 | 6 | 7 | 5 | 6 | 31 |
| 16. | Subyek 16 | 5 | 4 | 9 | 7 | 6 | 31 |
| 29. | Subyek 29 | 5 | 5 | 8 | 5 | 8 | 31 |
| 1. | Subyek 1 | 9 | 6 | 6 | 5 | 6 | 32 |
| 15. | Subyek 15 | 8 | 4 | 9 | 5 | 6 | 32 |
| 18. | Subyek 18 | 11 | 5 | 6 | 6 | 4 | 32 |
| 11. | Subyek 11 | 6 | 5 | 6 | 6 | 10 | 33 |
| 19. | Subyek 19 | 8 | 4 | 9 | 5 | 7 | 33 |
| 21. | Subyek 21 | 11 | 5 | 6 | 5 | 6 | 33 |
| 3. | Subyek 3 | 10 | 4 | 6 | 6 | 7 | 34 |
| 2. | Subyek 2 | 9 | 6 | 6 | 6 | 8 | 35 |
| 5. | Subyek 5 | 7 | 5 | 9 | 9 | 7 | 35 |
| 13. | Subyek 13 | 8 | 5 | 9 | 6 | 9 | 35 |
| 20. | Subyek 20 | 8 | 7 | 6 | 5 | 9 | 35 |
| 22. | Subyek 22 | 9 | 4 | 6 | 6 | 10 | 35 |
| 24. | Subyek 24 | 6 | 9 | 7 | 6 | 7 | 35 |
| 28. | Subyek 28 | 12 | 10 | 7 | 7 | 5 | 35 |
| 23. | Subyek 23 | 14 | 5 | 7 | 8 | 6 | 36 |
| 27. | Subyek 27 | 8 | 6 | 9 | 6 | 7 | 36 |
| 17. | Subyek 17 | 12 | 4 | 10 | 6 | 9 | 36 |
| 8. | Subyek 8 | 9 | 6 | 12 | 4 | 7 | 38 |
| 26. | Subyek 26 | 9 | 8 | 9 | 6 | 7 | 39 |
| 25. | Subyek 25 | 12 | 11 | 9 | 10 | 9 | 51 |
| Jumlah | | 242 | 154 | 219 | 169 | 195 | 988 |
| Rata-rata | | 8,3448 | 5,3103 | 7,55172 | 5,828 | 6,7241 |  |

Analisis daya beda soal uji coba dapat dilihat pada uraian berikut.

Rumus menentukan daya beda yaitu 𝐷 = ̅𝑘𝑒𝑙𝑜𝑚𝑝𝑜𝑘 𝑎𝑡𝑎𝑠−̅𝑘𝑒𝑙𝑜𝑚𝑝𝑜𝑘 𝑏𝑎𝑤𝑎ℎ

𝑠𝑘𝑜𝑟 𝑚𝑎𝑘𝑠𝑖𝑚𝑢𝑚

Besar masing-masing kelompok adalah 27% dari jumlah siswa yang ikut uji coba.

27% × 29 = 7,83 ≈ 8. Jadi masing-masing kelompok terdapat 8 siswa Kriteria penilaiannya yaitu:

|  |  |
| --- | --- |
| **Indeks daya beda** | **Kriteria** |
| 𝐷 ≤ 0,00 | Jelek sekali (soal tidak dipakai) |
| 0,00 < 𝐷 ≤ 0,20 | Jelek |
| 0,20 < 𝐷 ≤ 0,40 | Cukup |
| 0,40 < 𝐷 ≤ 0,70 | Baik |
| 0,70 < 𝐷 ≤ 1,00 | Baik sekali |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **KELOMPOK** | **NAMA** | 𝑋 | | | | |
| **1** | **2** | **3** | **4** | **5** |
| **KELOMPOK BAWAH** | Layli Riza Nadiyya | 8 | 0 | 7 | 3 | 0 |
| Maulida Rahmaniyah | 9 | 0 | 6 | 7 | 4 |
| Dwi Sania Noor Azizah | 5 | 5 | 8 | 5 | 6 |
| Muthia Fairuza Khusna | 6 | 5 | 3 | 6 | 6 |
| Dinda Damara | 5 | 5 | 8 | 5 | 7 |
| Denny Bagus Wahyu S. | 8 | 5 | 6 | 6 | 6 |
| Lily Setya Apriliani | 7 | 6 | 7 | 5 | 6 |
| Nurissyifa Ramadhani | 5 | 4 | 9 | 7 | 6 |
| **MEAN** |  | 6,625 | 3,75 | 6,75 | 5,5 | 5,125 |
| **KELOMPOK ATAS** | Shella Novita S. | 6 | 9 | 7 | 6 | 7 |
| Septina Maula Husna | 14 | 5 | 7 | 8 | 6 |
| Widiyaningrum | 8 | 6 | 9 | 6 | 7 |
| Pradina Kurnia Sari | 13 | 4 | 10 | 6 | 9 |
| Wildan Anggita Rivaldi | 14 | 10 | 7 | 7 | 5 |
| Fauzul Muna | 9 | 6 | 12 | 4 | 7 |
| Sonya Novita Dewi | 9 | 8 | 9 | 6 | 7 |
| Shinta Kumala Dewi | 14 | 11 | 9 | 10 | 9 |
| **MEAN** | | 10,875 | 7,375 | 8,75 | 6,625 | 7,125 |
| **DAYA BEDA** | | 0,35417 | 0,30208 | 0,16667 | 0,1125 | 0,2 |

Berdasarkan perhitungan sebelumnya, dapat disimpulkan bahwa daya beda soal uji coba adalah sebagai berikut.

|  |  |  |
| --- | --- | --- |
| No. Soal | 𝐷 | Kriteria |
| 1. | 0,35417 | Cukup |
| 2. | 0,30208 | Cukup |
| 3. | 0,16667 | Jelek |
| 4. | 0,1125 | Jelek |
| 5. | 0,2 | Jelek |

*Lampiran 17*

#### **ANALISIS TINGKAT KESUKARAN**

Hasil jawaban siswa kelas uji coba dapat dilihat pada tabel berikut.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Nama | 𝑋 | | | | | 𝑌 |
| 1 | 2 | 3 | 4 | 5 |
| 9. | Layli Riza Nadiyya | 8 | 0 | 7 | 3 | 0 | 18 |
| 12. | Maulida Rahmaniyah | 9 | 0 | 6 | 7 | 4 | 26 |
| 7. | Dwi Sania Noor Azizah | 5 | 5 | 8 | 5 | 6 | 29 |
| 14. | Muthia Fairuza Khusna | 6 | 5 | 6 | 3 | 6 | 29 |
| 6. | Dinda Damara | 5 | 5 | 8 | 5 | 7 | 30 |
| 4. | Denny Bagus Wahyu S. | 8 | 5 | 6 | 6 | 6 | 31 |
| 10. | Lily Setya Apriliani | 7 | 6 | 7 | 5 | 6 | 31 |
| 16. | Nurissyifa Ramadhani | 5 | 4 | 9 | 7 | 6 | 31 |
| 29. | Yasmin Noor | 5 | 5 | 8 | 5 | 8 | 31 |
| 1. | Ahmad Riko Andrianto | 9 | 6 | 6 | 5 | 6 | 32 |
| 15. | Noor Maulida Khasanah | 8 | 4 | 9 | 5 | 6 | 32 |
| 18. | Rajwa Habibah Hanum | 11 | 5 | 6 | 6 | 4 | 32 |
| 11. | Linda Nor Safitri | 6 | 5 | 6 | 6 | 10 | 33 |
| 19. | Rizqi Lazuardhi | 8 | 4 | 9 | 5 | 7 | 33 |
| 21. | Salahuddin Rasyid | 11 | 5 | 6 | 5 | 6 | 33 |
| 3. | Baity Jannati Ramadhani | 10 | 4 | 6 | 6 | 7 | 34 |
| 2. | Arum Tis Anata | 9 | 6 | 6 | 6 | 8 | 35 |
| 5. | Diana Elina Pertiwi | 7 | 5 | 9 | 9 | 7 | 35 |
| 13. | Millenia Artis Shintia | 8 | 5 | 9 | 6 | 9 | 35 |
| 20. | Rr. Herdian Nur Ayu W. | 8 | 7 | 6 | 5 | 9 | 35 |
| 22. | Sarisawati Intishar | 9 | 4 | 6 | 6 | 10 | 35 |
| 24. | Shella Novita S. | 6 | 9 | 7 | 6 | 7 | 35 |
| 28. | Wildan Anggita Rivaldi | 12 | 10 | 7 | 7 | 5 | 35 |
| 23. | Septina Maula Husna | 14 | 5 | 7 | 8 | 6 | 36 |
| 27. | Widiyaningrum | 8 | 6 | 9 | 6 | 7 | 36 |
| 17. | Pradina Kurnia Sari | 12 | 4 | 10 | 6 | 9 | 36 |
| 8. | Fauzul Muna | 9 | 6 | 12 | 4 | 7 | 38 |
| 26. | Sonya Novita Dewi | 9 | 8 | 9 | 6 | 7 | 39 |
| 25. | Shinta Kumala Dewi | 12 | 11 | 9 | 10 | 9 | 51 |
| Jumlah | | 242 | 154 | 219 | 169 | 195 | 988 |
| Rata-rata | | 8,3448 | 5,3103 | 7,55172 | 5,828 | 6,7241 |  |

Rumus yang digunakan untuk menganalisis taraf kesukaran yaitu (Arikunto, 2009)

Keterangan:

𝑃: indeks kesukaran

P: rata-rata skor item Kriteria penilaiannya yaitu:

𝑃 =



𝑠𝑘𝑜𝑟 𝑚𝑎𝑘𝑠𝑖𝑚𝑢𝑛

|  |  |
| --- | --- |
| **Indeks kesukaran** | **Kriteria** |
| 0,00 < 𝑃 ≤ 0,30 | Soal sukar |
| 0,30 < 𝑃 ≤ 0,70 | Soal sedang |
| 0,70 < 𝑃 ≤ 1,00 | Soal mudah |

Hasil yang diperoleh:

|  |  |  |
| --- | --- | --- |
| No. Soal | 𝑃 | Kriteria |
| 1. | 0,71264 | Soal Mudah |
| 2. | 0,4425 | Soal Sedang |
| 3. | 0,62931 | Soal Sedang |
| 4. | 0,9713 | Soal Mudah |
| 5. | 0,5603 | Soal Sedang |

*Lampiran 18*

#### **REKAPITULASI ANALISIS BUTIR SOAL**

Setelah melakukan analisis butir soal yang meliputi uji validitas, uji reliabilitas, analisis daya beda dan analisis taraf kesukaran, hasil yang diperoleh dirangkum dalam tabel berikut.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No.  Soal | Validitas | Reliabilitas | Daya  Pembeda | Tingkat  Kesukaran | Keterangan |
| 1. | Valid | Reliabel | Cukup | Mudah | Dipakai |
| 2. | Valid | Cukup | Sedang | Dipakai |
| 3. | Valid | Jelek | Sedang | Dipakai |
| 4. | Valid | Jelek | Mudah | Dipakai |
| 5. | Valid | Jelek | Sedang | Dipakai |

c