

**FINAL**



**education**

Department:  
Education  
**PROVINCE OF KWAZULU-NATAL**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS P1**  
**PREPARATORY EXAMINATION**  
**SEPTEMBER 2022**  
**MARKING GUIDELINE**

**MARKS: 150**

**TIME: 3 hours**

**NOTE:**

- If a candidate answered a QUESTION TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

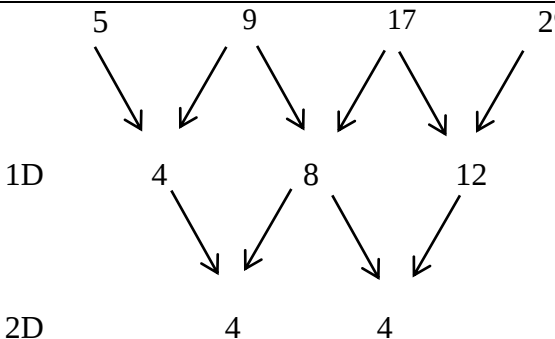
**This marking guideline consists of 12 pages.**

**QUESTION 1**

|       |                                                                                                                                                                                                                                                                                                                                             |                                                                                             |     |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----|
| 1.1.1 | $x = -5 \text{ or } x = \frac{1}{2}$                                                                                                                                                                                                                                                                                                        | A✓ $-5$ A✓ $\frac{1}{2}$                                                                    | (2) |
| 1.1.2 | $-3x^2 - 7x + 8 = 0$<br>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$<br>$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(-3)(8)}}{2(-3)}$<br>$x = -3,17 \text{ or } 0,84$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;"> (Penalize 1 mark if rounding off is incorrect – once here for entire paper) </div> | A✓ standard form<br>CA✓ correct substitution into quadratic formula<br>CA✓CA✓ answers       | (4) |
| 1.1.3 | $\sqrt{x+5} + 1 = x$<br>$\sqrt{x+5} = x - 1$<br>$(\sqrt{x+5})^2 = (x-1)^2$<br>$x+5 = x^2 - 2x + 1$<br>$x^2 - 3x - 4 = 0$<br>$(x+1)(x-4) = 0$<br>$x = -1 \text{ or } x = 4$<br>n/a                                                                                                                                                           | A✓ isolating surd<br><br>CA✓ standard form<br>CA✓ factors<br>CA✓ $x \neq -1$<br>CA✓ $x = 4$ | (5) |
| 1.1.4 | $-5 \leq x \leq \frac{3}{2}$                                                                                                                                                                                                                                                                                                                | A✓ critical value $-5$<br>A✓ critical value $\frac{3}{2}$<br>CA✓ interval notation          | (3) |

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                |     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.2  | $x + 3y = 5 \rightarrow (1)$ $xy + y^2 - 3 = 0 \rightarrow (2)$ <p>From (1): <math>x = 5 - 3y \rightarrow (3)</math></p> <p>Substituting (3) into (2):</p> $y(5 - 3y) + y^2 - 3 = 0$ $-2y^2 + 5y - 3 = 0$ $2y^2 - 5y + 3 = 0$ $(2y - 3)(y - 1) = 0$ $y = \frac{3}{2} \text{ or } y = 1$ $x = \frac{1}{2} \text{ or } x = 2$ <p><b>OR</b></p> $x + 3y = 5 \rightarrow (1)$ $xy + y^2 - 3 = 0 \rightarrow (2)$ <p>From (1): <math>y = \frac{5-x}{3} \rightarrow (3)</math></p> <p>Substituting (3) into (2):</p> $x\left(\frac{5-x}{3}\right) + \left(\frac{5-x}{3}\right)^2 - 3 = 0$ $3x(5-x) + 25 - 10x + x^2 - 27 = 0$ $-2x^2 + 5x - 2 = 0$ $2x^2 - 5x + 2 = 0$ $(2x - 1)(x - 2) = 0$ $x = \frac{1}{2} \text{ or } x = 2$ $y = \frac{3}{2} \text{ or } y = 1$ | <p>A✓ making x the subject</p> <p>CA✓ substitution</p> <p>CA✓ standard form</p> <p>CA✓ factors</p> <p>CA✓ y – values</p> <p>CA✓ x – values</p> <p><b>OR</b></p> <p>A✓ making y the subject</p> <p>CA✓ substitution</p> <p>CA✓ standard form</p> <p>CA✓ factors</p> <p>CA✓ x – values</p> <p>CA✓ y – values</p> | (6) |
| 1.3  | $\frac{\sqrt[n]{10^n + 2^{n+2}}}{\sqrt{5^{2n} + 4 \cdot 5^n}}$ $= \frac{\sqrt[n]{2^n \cdot 5^n + 2^n \cdot 2^2}}{\sqrt{5^{2n} + 4 \cdot 5^n}}$ $= \frac{\sqrt[n]{2^n(5^n + 4)}}{\sqrt{5^n(5^n + 4)}}$ $= \sqrt[n]{\frac{2^n}{5^n}}$ $= \frac{2}{5}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>A✓ factorising numerator</p> <p>A✓ factorising denominator</p> <p>CA✓ simplifying</p> <p>CA✓ answer</p>                                                                                                                                                                                                     | (4) |
| [24] |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                |     |

**QUESTION 2**

|     |                                                                                                                                                                                                                                                                                                             |                                                                                                                                          |             |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 2.1 | 45 ; 65                                                                                                                                                                                                                                                                                                     | AA✓✓ answers                                                                                                                             | (2)         |
| 2.2 |  <p>1D</p> <p>2D</p> <p> <math>2a = 4 \quad \therefore a = 2</math><br/> <math>3a + b = 4 \quad \therefore b = -2</math><br/> <math>a + b + c = 5 \quad \therefore c = 5</math><br/> <math>T_n = 2n^2 - 2n + 5</math> </p> | <p> A✓ <math>2a = 4</math><br/> A✓ <math>a = 2</math><br/> A✓ <math>3a + b = 4</math><br/> A✓ <math>a + b + c = 5</math> </p>            | (4)         |
| 2.3 | $T_n = 2n^2 - 2n + 5 = 2023$<br>$2n^2 - 2n - 2018 = 0$<br>$n^2 - n - 1009 = 0$<br>$n = \frac{1 \pm \sqrt{1 + 4036}}{2} = 32.27 \text{ or } -31.27$<br><p>Since <math>n</math> is not a Natural Number, 2023 is not a term of the sequence.</p>                                                              | <p> A✓ equating <math>n^{\text{th}}</math> term to 2023<br/> CA✓ standard form<br/> CA✓ <math>n</math> – values<br/> CA✓ conclusion </p> | (4)         |
|     |                                                                                                                                                                                                                                                                                                             |                                                                                                                                          | <b>[10]</b> |

**QUESTION 3**

|  |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                         |            |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|  | <p>26 ; 22 ; 18 ; ...</p> $S_n = \frac{n}{2} [2a + (n - 1)d]$ $S_{50} = \frac{50}{2} [2(26) + (50 - 1)(-4)]$ $S_{50} = -3600$ <p><b>OR</b></p> $S_n = \frac{n}{2} [a + T_n]$ $S_{50} = \frac{50}{2} [26 + (-170)]$ $S_{50} = -3600$ | <p> A✓ <math>n</math> – value<br/> A✓ <math>a</math> – value<br/> A✓ <math>d</math> – value<br/> CA✓ answer </p> <p><b>OR</b></p> <p> A✓ <math>n</math> – value<br/> A✓ <math>a</math> – value<br/> A✓ <math>T_{50}</math> – value<br/> CA✓ answer </p> | (4)        |
|  |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                         | (4)        |
|  |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                         | <b>[4]</b> |

**QUESTION 4**

|       |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                   |             |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------|
| 4.1   | $S_n = a + ar + ar^2 + ar^3 + \dots + ar^{n-1} \rightarrow (1)$<br>$rS_n = ar + ar^2 + ar^3 + \dots + ar^{n-1} + ar^n \rightarrow (2)$<br>$(2) - (1):$<br>$rS_n - S_n = ar^n - a$<br>$S_n(r - 1) = a(r^n - 1)$<br>$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$                                                                                                 | A✓ equation (1)<br>A✓ equation (2)<br><br>A✓ subtracting LHS and RHS terms<br><br>A✓ factorising                                  | (4)         |
| 4.2.1 | AS: $12 + d; 12 + 2d; \dots$<br>GS: $12r; 12r^2; \dots$                                                                                                                                                                                                                                                                                                      | A✓ AS set up of terms<br>A✓ GS set up of terms                                                                                    | (2)         |
| 4.2.2 | $12 + d = 12r \rightarrow (1)$<br>$36 + 3d + 3 = 12 + 12r + 12r^2 \rightarrow (2)$<br>From (1): $d = 12r - 12 \rightarrow (3)$<br>Substituting (3) into (2), we have<br>$36 + 3(12r - 12) + 3 = 12 + 12r + 12r^2$<br>$12 + (12r - 12) + 1 = 4 + 4r + 4r^2$<br>$4r^2 - 8r + 3 = 0$<br>$(2r - 1)(2r - 3) = 0$<br>$r = \frac{1}{2} \text{ or } r = \frac{3}{2}$ | A✓ equation (1) and (2)<br><br>A✓ making $d$ the subject<br><br><br>CA✓ standard quadratic form<br>CA✓ factors<br><br>CA✓ answers | (5)         |
|       |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                   | <b>[11]</b> |

**QUESTION 5**

|     |                                                                                          |                                                            |                    |
|-----|------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------|
| 5.1 | $y = 1 - \frac{1}{x-2}$<br>$x = 2 \text{ and } y = 1$                                    | A✓ $x = 2$<br>A✓ $y = 1$                                   | (2)                |
| 5.2 | $y$ – intercept : $\left(0; 1\frac{1}{2}\right)$<br>$x$ – intercept: $x = 3$<br>$(3; 0)$ | A✓ $y$ -intercept<br><br>A✓ $x = 3$<br>CA✓ coordinate form | (3)                |
| 5.3 | $y = x - 1$                                                                              | A✓ Gradient value<br><br>A✓ $y$ – intercept                | (2)                |
| 5.4 | $y \in R; y \neq 1$<br><b>OR</b><br>$y \in (-\infty; 1) \cup (1; \infty)$                | A✓ answer<br><br><b>OR</b><br>A✓ answer                    | (1)<br><br><br>(1) |
|     |                                                                                          |                                                            | <b>[8]</b>         |



**QUESTION 7**

|     |                                                     |                                                                                                             |            |
|-----|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------|
| 7.1 | A(0 ; 1)                                            | AA✓✓ answer                                                                                                 | (2)        |
| 7.2 | $y = a^x$<br>$32 = a^5$<br>$a = 2$                  | A✓ substitution of point T(5;32)<br>A✓ answer                                                               | (2)        |
| 7.3 | $x \in R$<br><b>OR</b><br>$x \in (-\infty; \infty)$ | A✓ answer<br><b>OR</b><br>A✓ answer                                                                         | (1)<br>(1) |
| 7.4 | $y = \log_2 x$                                      | CACA✓✓ answer                                                                                               | (2)        |
| 7.5 | $\log_2 x = 5$<br>$x = 2^5 = 32$<br>$0 < x \leq 32$ | CA✓ end points<br>A✓ interval<br><br><b>Can be solved by log inequalities.<br/>Answer Only – Full marks</b> | (2)        |
|     |                                                     |                                                                                                             | <b>[9]</b> |

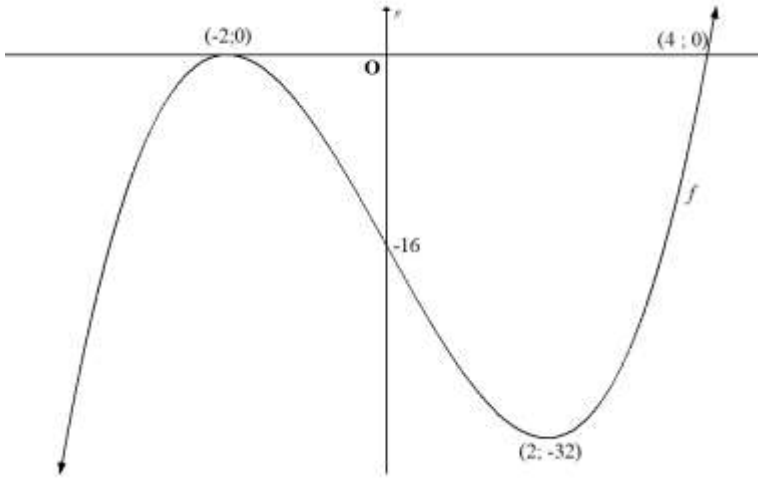
**QUESTION 8**

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                             |             |             |       |             |      |  |  |  |  |     |     |     |       |     |                                                                                                                                                                                                                                                   |     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------|-------------|------|--|--|--|--|-----|-----|-----|-------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 8.1        | <table border="1"> <tr> <td>1 Jun 2021</td> <td>31 Jul 2021</td> <td>31Aug 2021</td> <td>.....</td> <td>30 Apr 2023</td> </tr> <tr> <td>5000</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>600</td> <td>600</td> <td>600</td> <td>.....</td> <td>600</td> </tr> </table> <p>Dipinda's final amount in the account:</p> $= P(1 + i)^n + \frac{x[(1 + i)^n - 1]}{i}$ $= 5000 \left(1 + \frac{14.25\%}{12}\right)^{23} + \frac{600 \left[\left(1 + \frac{14.25\%}{12}\right)^{23} - 1\right]}{\frac{14.25\%}{12}}$ $= R22\,321,54$ | 1 Jun 2021                                                                                                                                                  | 31 Jul 2021 | 31Aug 2021  | ..... | 30 Apr 2023 | 5000 |  |  |  |  | 600 | 600 | 600 | ..... | 600 | <p><u>A – formula</u><br/> A✓ value of <math>n</math><br/> A✓ value of <math>i</math></p> <p><u>FV – formula</u><br/> A✓ value of <math>n</math></p> <p>CA✓ correct substitution into A<br/> CA✓ correct substitution into Fv<br/> CA✓ answer</p> | (6) |
| 1 Jun 2021 | 31 Jul 2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 31Aug 2021                                                                                                                                                  | .....       | 30 Apr 2023 |       |             |      |  |  |  |  |     |     |     |       |     |                                                                                                                                                                                                                                                   |     |
| 5000       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                             |             |             |       |             |      |  |  |  |  |     |     |     |       |     |                                                                                                                                                                                                                                                   |     |
| 600        | 600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 600                                                                                                                                                         | .....       | 600         |       |             |      |  |  |  |  |     |     |     |       |     |                                                                                                                                                                                                                                                   |     |
| 8.2.1      | $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $800\,000 = \frac{10000 \left[1 - \left(1 + \frac{13.35\%}{12}\right)^{-n}\right]}{\frac{13.35\%}{12}}$ $\left(1 + \frac{13.35\%}{12}\right)^{-n} = \frac{11}{100} = 0,11$ $-n = \log_{\left(1 + \frac{13.35\%}{12}\right)} 0,11$ $n = 199,5083362$ <p>Therefore the loan will be paid off in 200 months.<br/> <b>N.B. Candidates can also substitute the value of 200 into the Pv formula to show that the loan will be paid in 200 months.</b></p>                                                      | <p>A✓ value of <math>P</math>, <math>x</math> and value of <math>i</math><br/> A✓ substitution into formula</p> <p>A✓ use of logs<br/> A✓ decimal value</p> | (4)         |             |       |             |      |  |  |  |  |     |     |     |       |     |                                                                                                                                                                                                                                                   |     |

|             |                                                                                                                                                                                                                                                                                                                                                         |                                                                    |     |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----|
| 8.2.2a      | $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $= \frac{10\,000 \left[ 1 - \left( 1 + \frac{13.35\%}{12} \right)^{-80,5083362} \right]}{\frac{13.35\%}{12}}$ $= R530\,009,55$ <p><b>If <math>n = 81</math> is used and <math>P = R532\,010,58</math></b><br/> <b>Give a maximum of 2/3 marks</b><br/> <b>N.B. Candidates can also use the method of A – Fv</b></p> | A✓ value of $n$<br>A✓ value of $i$<br>CA✓ answer                   | (3) |
| 8.2.2b      | $A = P(1 + i)^n$ $A = R530\,009,55 \left( 1 + \frac{13.35\%}{12} \right)^4$ $A = R\,553\,991,4839$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $553\,991,4839 = \frac{x \left[ 1 - \left( 1 + \frac{13.35\%}{12} \right)^{-77} \right]}{\frac{13.35\%}{12}}$ $x = R10\,748,55$                                                                                  | A✓ value of $n$<br>CA✓ answer<br><br>A✓ value of $n$<br>CA✓ answer | (4) |
| <b>[17]</b> |                                                                                                                                                                                                                                                                                                                                                         |                                                                    |     |



**QUESTION 10**

|        |                                                                                                                                                                       |                                                                                        |             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------|
| 10.1.1 | $x^3 - 12x - 16 = 0$<br>$(x + 2)(x^2 - 2x - 8) = 0$<br>$(x + 2)(x + 2)(x - 4) = 0$<br>$x = -2 \text{ or } x = 4$                                                      | A✓ binomial factor<br>AA✓✓ factors<br>CA CA ✓✓ answers                                 | (5)         |
| 10.1.2 | $f(x) = x^3 - 12x - 16$<br>$f'(x) = 3x^2 - 12 = 0$<br>$x^2 - 4 = 0$<br>$(x + 2)(x - 2) = 0$<br>$x = -2 \text{ or } x = 2$<br>$y = 0 \text{ or } y = -32$              | A✓ derivative and equating to 0<br><br>CA✓ factors<br>CA✓ x – values<br>CA✓ y – values | (4)         |
| 10.1.3 |                                                                                     | CA✓ Maximum and Minimum points<br>CA✓ x – intercepts<br>A✓ y – intercept<br>A✓ shape   | (4)         |
| 10.1.4 | $f''(x) = 6x > 0$<br>$x > 0$ <div style="border: 1px solid black; padding: 5px; display: inline-block;">Answer only: full marks</div>                                 | A✓ 2 <sup>nd</sup> derivative<br>A✓ answer                                             | (2)         |
| 10.2   | $p'(x) = -3x^2 - 8$<br>$-3x^2 \leq 0 \text{ for all } x \in \mathbb{R}$<br>$-3x^2 - 8 \leq 0$<br>The gradient of all tangents to the graph of $p$ is always negative. | A✓ derivative<br><br>A✓ reasoning<br><br>A✓ reasoning                                  | (3)         |
|        |                                                                                                                                                                       |                                                                                        | <b>[18]</b> |

**QUESTION 11**

|      |                                                                                                                                      |                                                                                                                                  |            |
|------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------|
| 11.1 | $L = 1000 + 6t - \frac{t^2}{4}$ $\frac{dL}{dt} = 6 - \frac{1}{2}t$                                                                   | AA✓✓ for each term                                                                                                               | (2)        |
| 11.2 | For greatest lead: $\frac{dL}{dt} = 0$<br>$6 - \frac{1}{2}t = 0$<br>$t = 12$ minutes                                                 | CA✓ $\frac{dL}{dt} = 0$<br>or<br>equating derivative to 0<br><br>CA✓ answer                                                      | (2)        |
| 11.3 | $\frac{dL}{dt}_{t=60} = 6 - \frac{1}{2}(60)$ $\frac{dL}{dt}_{t=60} = -24$<br>The runner's lead is decreasing at 24 metres per minute | CA✓ substitution of $t = 60$ into derivative <b>and</b> value of $-24$<br><br>CA✓ conclusion (provided the derivative is $-ve$ ) | (2)        |
|      |                                                                                                                                      |                                                                                                                                  | <b>[6]</b> |

**QUESTION 12**

|      |                            |                                    |            |
|------|----------------------------|------------------------------------|------------|
| 12.1 | 7! or 5 040                | A✓ A✓ 7! or 5040                   | (2)        |
| 12.2 | $6! \times 2!$<br>$= 1440$ | AA✓✓ $6! \times 2!$<br><br>A✓ 1440 | (3)        |
|      |                            |                                    | <b>[5]</b> |

**QUESTION 13**

| 13.1    | $P(A \text{ or } B) = P(A) + P(B)$<br>$0,63 = 3P(B)+P(B)$<br>$4P(B) = 0,63$<br>$P(B) = 0,16$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A✓ condition for mutually exclusive events<br>A✓ correct substitution<br>A✓ P(B) value | (3)             |          |                                      |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------|----------|--------------------------------------|----------|---------------|--|--|-----------|---|----|--------------------------------------|--|---|--|--|--|--|---------|--|------------|----|-----|--------------------------------------|--|--|--|--|--|--|---------|--|-----------|---|-----|--------------------------------------|--|----|--|--|--|--|--|--|------------|----|------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 13.2.1  | $P(\text{Both Picture cards}) = \frac{12}{52} \times \frac{11}{51}$<br><br>$= \frac{11}{221} = 0,0498 = 4,98 \%$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | A✓ $\frac{12}{52} \times \frac{11}{51}$<br><br>A ✓ $\frac{11}{221} = 0,0498 = 4,98 \%$ | (2)             |          |                                      |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
| 13.2.2  | <table border="1"><thead><tr><th></th><th>1<sup>ST</sup></th><th></th><th>2<sup>ND</sup></th><th>Outcomes</th><th>Probabilities</th></tr></thead><tbody><tr><td></td><td></td><td>11/51 → P</td><td>P</td><td>PP</td><td><math>\frac{12}{52} \times \frac{11}{51}</math></td></tr><tr><td></td><td>P</td><td></td><td></td><td></td><td></td></tr><tr><td>12/52 →</td><td></td><td>40/51 → NP</td><td>NP</td><td>PNP</td><td><math>\frac{12}{52} \times \frac{40}{51}</math></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>40/52 →</td><td></td><td>12/51 → P</td><td>P</td><td>NPP</td><td><math>\frac{40}{52} \times \frac{12}{51}</math></td></tr><tr><td></td><td>NP</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>39/51 → NP</td><td>NP</td><td>NPNP</td><td><math>\frac{40}{52} \times \frac{39}{51}</math></td></tr></tbody></table> <p>P (at least 1 picture card)</p> <p>= 1 – P (no picture card)</p> <p>= <math>1 - \left(\frac{40}{52} \times \frac{39}{51}\right)</math></p> <p>= <math>\frac{7}{17} = 0,4118 = 41,18 \%</math></p> <p><b>OR</b></p> <p>P (at least 1 picture)</p> <p>= <math>\left(\frac{12}{52} \times \frac{11}{51}\right) + \left(\frac{12}{52} \times \frac{40}{51}\right) + \left(\frac{40}{52} \times \frac{12}{51}\right)</math></p> <p>= <math>\frac{7}{17} = 0,4118 = 41,18 \%</math></p> |                                                                                        | 1 <sup>ST</sup> |          | 2 <sup>ND</sup>                      | Outcomes | Probabilities |  |  | 11/51 → P | P | PP | $\frac{12}{52} \times \frac{11}{51}$ |  | P |  |  |  |  | 12/52 → |  | 40/51 → NP | NP | PNP | $\frac{12}{52} \times \frac{40}{51}$ |  |  |  |  |  |  | 40/52 → |  | 12/51 → P | P | NPP | $\frac{40}{52} \times \frac{12}{51}$ |  | NP |  |  |  |  |  |  | 39/51 → NP | NP | NPNP | $\frac{40}{52} \times \frac{39}{51}$ | <p>A✓ Method</p> <p>A✓ Correct Substitution</p> <p>A✓ <math>\frac{7}{17} = 0,4118 = 41,18 \%</math></p> <p><b>OR</b></p> <p>AA✓✓probabilities</p> <p>A✓ <math>\frac{7}{17} = 0,4118 = 41,18 \%</math></p> | (3) |
|         | 1 <sup>ST</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                        | 2 <sup>ND</sup> | Outcomes | Probabilities                        |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11/51 → P                                                                              | P               | PP       | $\frac{12}{52} \times \frac{11}{51}$ |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|         | P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                        |                 |          |                                      |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
| 12/52 → |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 40/51 → NP                                                                             | NP              | PNP      | $\frac{12}{52} \times \frac{40}{51}$ |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                        |                 |          |                                      |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
| 40/52 → |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12/51 → P                                                                              | P               | NPP      | $\frac{40}{52} \times \frac{12}{51}$ |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|         | NP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                        |                 |          |                                      |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 39/51 → NP                                                                             | NP              | NPNP     | $\frac{40}{52} \times \frac{39}{51}$ |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                        | [8]             |          |                                      |          |               |  |  |           |   |    |                                      |  |   |  |  |  |  |         |  |            |    |     |                                      |  |  |  |  |  |  |         |  |           |   |     |                                      |  |    |  |  |  |  |  |  |            |    |      |                                      |                                                                                                                                                                                                           |     |

**TOTAL: 150**