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| **Year 11 Specialist Mathematics**  Semester 1 2020  **Test 1: Combinatorics and Introduction to Proofs Weighting: 6%**  **Resource Free Section**  **[Australian Curriculum Reference Numbers: 1.3.1-1.3.5, 1.1.1-1.1.9, 2.1.5]** |

**Student Name:­­­­­­­­­­­­­­­­­­ SOLUTIONS Teacher:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Time: 25 min Total Marks =**

**Instructions:**   
You **ARE** **NOT** allowed any notes or calculator.   
You will be supplied with a formula booklet.

1. Consider the statement:

*“If a quadrilateral has all four sides with equal length, then it is a square”*

* 1. State the inverse of the statement.

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| Image result for red tick png |

* 1. Image result for red tick pngState the converse of the statement.

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* 1. Is the contrapositive of statement true or false? Justify your answer.

Image result for red tick pngIt is false

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| Counterexample: Rhombus |
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[1,1,2 = 4 marks]

1. A pencil case contains a variety of red, blue, black, and green pens.
   1. Image result for red tick pngHow many pens do you need to have to be certain of having three pens of the same colour?

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* 1. What is the smallest number of pens you can have in the pencil case to ensure you have at least 4 red pens, or 3 green pens, or 2 blue pens, or 5 black pens?

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[2,2 = 4 marks]

* 1. Image result for red tick pngImage result for red tick pngImage result for red tick pngImage result for red tick pngImage result for red tick pngProve the following by proving its contrapositive:

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| Q.E.D |

* 1. Image result for red tick pngImage result for red tick pngImage result for red tick pngImage result for red tick pngHence prove the equivalence statement:

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| Q.E.D |

[5,5 = 10 marks]

1. Evaluate the following:
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[1,3 = 4 marks]

1. Image result for red tick pngImage result for red tick pngImage result for red tick png Determine the value of if it is known that for

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[5 marks]

\*\*\* End of Resource Free Section \*\*\*

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| **Ye**ar **11 Specialist Mathematics**  Semester 1 2020  **Test 1: Combinatorics and Introduction to Proofs Weighting: 6%**  **Resource Rich Section**  **[Australian Curriculum Reference Numbers: 1.3.1-1.3.5, 1.1.1-1.1.9, 2.1.5]** |

**Student Name:­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Time: 25 min Total Marks =**

**Instructions:**   
You **ARE** allowed a ClassPad calculator and/or scientific calculator.  
You **ARE** **NOT** allowed any notes.   
You will be supplied with a formula booklet.

1. The school’s mixed basketball squad consists of 6 girls and 4 boys.
   1. How many teams are possible if you must have more girls than boys on a team of 5 players?

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| Image result for red tick png3 girls: |
| Image result for red tick png4 girls: |
| Image result for red tick pngImage result for red tick png5 girls: |
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* 1. Image result for red tick pngThe school’s mixed basketball team won its tournament and is getting a photo taken with all 10 players. How many photos are possible if the photo consists of two rows of 5, and the captain Emma must be “front and centre” with the vice-captain Hashva and MVP Alex on either side of her?

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[4,3 = 7 marks]

* 1. Image result for red tick pngHow many “words” can be formed using the letters from the word SLEEPLESS if you must use every letter?

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| Image result for red tick png |

* 1. Image result for red tick pngImage result for red tick pngImage result for red tick pngImage result for red tick pngImage result for red tick pngHow many 4-letter “words” can be formed using the letters from the word SLEEPLESS?

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* 1. Image result for red tick pngImage result for red tick pngImage result for red tick pngImage result for red tick pngHow many 4 letter ‘words’ can be made from the word if must be followed by , and you cannot have last?

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[2,5,4 = 11 marks]

1. Image result for red tick pngThere are 255 Year 11 students at Melville Senior High School. Of these students, 68 study Physics and 44 study Computer Science. 29 students study Chemistry and Physics, 14 study Physics and Computer Science and 19 study Computer Science and Chemistry. 9 students study all 3 subjects and 120 students study none of these subjects.   
     
   Use the inclusion-exclusion principle to determine the probability that a Year 11 student chosen at random studies chemistry but not Physics or Computer Science.

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| Image result for red tick pngImage result for red tick png **∴ 37 study Chem only** |
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| \*\*Deduct 2 Marks of Inclusion Exclusion Principle not used \*\* |
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[5 marks]

**\*\*\* End of Resource Rich Section \*\*\***