Student name: ______________________________ Student code: ______________________________

1. Provide a definition of the greatest common divisor $\gcd(a, b)$ of two positive numbers a and b.

2. Find $\gcd(54, 24, 72)$

3. Find $\gcd(x^2 + 7x + 6, x^2 - 5x - 6)$. Example. $\gcd((x + 2)(x + 3), (x + 2)(x + 4)) = x + 2$.

4. How many subsets are there in a set of 6 elements?

5. In how many ways can 7 pool balls be ordered?

6. How many values can a bitstring of length 8 have?

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7. Suppose you have a PIN code lock consisting of 4 numbers in the range $[0-9]$. How many possible PIN codes can such a lock take?

8. How many different committees of 5 people can be chosen from a group of 10 people?

9. Write out numbers between 2 and 12 which have no common divisors with 12

10. Convert 101_2 from binary to decimal representation.

11. Convert 34_{10} from decimal to binary representation.

12. Solve $x^2 + 4x = 21$.

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13. In which case the equation $ax^2 + bx + c = 0$ has exactly one solution?

14. Given a random variable which can take values $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ with equal probability, what is the probability of sampling an even number greater than 3?

15. What is the probability to obtain a number greater than 2 in a single throw of a die, given that the outcome is odd?

16. If a student succeeds in cheating at an examination, his/her chances of passing the exam is p. If the student will not be able to cheat his/her chances of passing exam are q. Cheating may succeed with probability c. If the cheating attempt fails, the student will make one another attempt to cheat again. What is the probability that the student will pass examination?

17. Solve the equations below.

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 5 \\ 2 & 5 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 6 \\ -4 \\ 27 \end{pmatrix} .$$

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18. You can run 0.2km every minute. The horse can run 0.5km every minute, but it takes 6 minutes to saddle the horse. How far can you get before the horse catches you?

19. Solve $3^{x^2-3x} = 81$.

20. Prove by induction on n:

$$\frac{1}{1\cdot 2} + \frac{1}{2\cdot 3} + \frac{1}{3\cdot 4} + \ldots + \frac{1}{n(n+1)} = 1 - \frac{1}{n+1} \ .$$

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STUDENT NOTES