# Things to remember for the Mathematics CRCT

## Numbers and Operations 20%

**Exponents**

1. When **multiplying** numbers with the same base, you must **add** the exponents. Example: $3^2 \times 3^3 = 3^5$
2. When **dividing** numbers with the same base, you must **subtract** the exponents. Example: $\frac{9^6}{9^4} = 9^2$
3. When you have a **negative** exponent, you must rewrite it as a positive exponent. Example: $4^{-3} = \frac{1}{4^3}$
4. When raising a power to another power, you must first multiply the exponents. Example: $(2^2)^3 = 2^6$
5. An **even** exponent will give you a positive answer. Example: $-2^2 = 4$
6. An **odd** exponent will give you a negative answer. Example: $-2^3 = -8$

**Scientific Notation**

7. The first number must be 1 or between a number that is greater than 1 but less than 10. Example: $2.6 \times 10^3$.

**Standard Form**

**Whole numbers**

Place a decimal at the end of the whole number and move it to the left until it is in between a number greater than 1 but less than 10. The number of times you moved the decimal will become your exponents with a base of 10. Your exponent will be positive.

| | Standard Form | Decimal moved | Scientific Notation |
|---|---|---|---|
| Example: | 6,500 | 6,500 | $6.5 \times 10^3$ |

**Decimal numbers**

Move the decimal to the right until it is in between a number greater than 1 but less than 10. The number of times you moved the decimal will become your exponent (it will be a negative exponent, because the original number was less than 1).

| | Standard Form | Decimal moved | Scientific Notation |
|---|---|---|---|
| Example: | 0.0000356 | 0.0000356 | $3.56 \times 10^{-5}$ |

**Scientific Notation**

**Negative exponents (small numbers have negative exponents)**

Move the decimal five times (the number of your exponent) to the left
Fill the empty spaces with zeros

| Scientific Notation | Decimal moved | Standard Form |
|---|---|---|
| Example: $1.50 \times 10^{-5}$ | 1.50 | .0000150 |

**Positive exponents (large numbers have positive exponents)**

Move the decimal three times (the number of your exponent) to the right and fill the empty spaces with zeros

| Scientific Notation | Decimal moved | Standard Form |
|---|---|---|
| Example: $9.4 \times 10^{3}$ | 9.4 | 9,400 |

**Multiplying in Scientific Notation:**

1. Multiply the Coefficients 2. Add the exponents 3. Make sure your answer is written in scientific notation. If not move the decimal and add one to your exponent.

**Dividing in Scientific Notation:**

1. Divide the coefficients. 2. Subtract the exponents 3. Make sure Your answer is in Scientific Notation. If not move the decimal and Subtract one from your exponents.

8. Understand that a perfect square is a number whose square root is a whole number. Example: the perfect square of 2 is 2 x 2 = 4. Therefore, 4 is a perfect square.
9. When estimating square root, you must first find the closet perfect square that is greater and less than that number. Example: what is the best whole-number estimate of $\sqrt{8}$. $\sqrt{8}$ Is in between the perfect square of $\sqrt{4}$ and $\sqrt{9}$. It is closer to the perfect square of $\sqrt{9}$. Therefore, the best estimate of the $\sqrt{8}$ is 3, because the $\sqrt{9}$ is 3.

**Adding or Subtracting in Scientific Notation:**

Before numbers in scientific notation can be added or subtracted, the exponents must be equal (the same).

Example: $(3.4 \times 10^{2}) + (4.57 \times 10^{3})$ $(7 \times 10^{5}) - (5.2 \times 10^{4})$

**Rational/Irrational Numbers**

10. Rational numbers are numbers that can be written as a fraction, or a repeating and terminating decimal. Examples: $\frac{3}{4}$; 0.5555; 0.125; - 3.5 and $\sqrt{9}$ are rational numbers. All perfect squares are rational.
11. Irrational numbers cannot be written as a fraction. Example: π; $\sqrt{8}$; $\sqrt{5}$; 0.1236972546 (non-repeating, non-terminating decimal).
12. Each square root has two perfect squares. Example: $\sqrt{9}$ is + 3 and – 3.
13. Remember to study your square roots and cube roots.

## Geometry 20%

**Transformations**:

**Reflection:** A mirror image of each point of a figure. To reflect across the x-axis, multiply its "y"- coordinate by – 1. To reflect across the y-axis, multiply its "x" – coordinate by -1.

**Rotation:** A transformation that moves each point of a figure the same Distance in the same direction.

90° Clockwise Rotation: To rotate a point 90° clockwise, switch the coordinates, then multiply the new y-coordinate by -1.

90° Counterclockwise Rotation: To rotate a point 90° counterclockwise, switch the coordinates, then multiply the new x-coordinates by -1.

180 ° Rotation: To rotate a figure a 180 °multiply its coordinates by -1 (DO NOT SWITCH THE COORDINATES) JUST CHANGE THE SIGNS.

**Dilations:** A transformation that stretches or shrinks a figure.

To dilate a figure, multiply the coordinates of each vertex by the scale factor.

**Translation:** When a figure is slid horizontally, vertically or diagonal. To translate a figure you simply add the coordinates for x and y.

14. Pythagorean Theorem is $a^2 + b^2 = c^2$--- where *a* and *b* are the legs and c is the hypotenuse (which is the longest side opposite the ninety degree angle).
15. Parallel slopes have the same slope. Example: $y = \frac{1}{2}x + 3$; parallel slope is $\frac{1}{2}$
16. Perpendicular slopes have the negative reciprocal slope. Example: $y = \frac{1}{2}x + 3$; perpendicular slope is $-\frac{2}{1}$ of -2.

22. Alternate interior angles are inside the two lines that are cut by the transversal. They are in a diagonal position. Their measurements are congruent.

23. Alternate exterior angles are outside of the two lines that are cut by transversal. They are in a diagonal position. Their measurements are congruent.

24. Corresponding angles have the same relative position. Their measurements are congruent.

Distance formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Volume of Cylinder= Bh (This is the same as $V=\pi r^2 h$; Volume of cone= $\frac{1}{3}$Bh

## Algebra 48%

25. To solve one and two step equations, you must do the inverse Operation. Addition is the inverse of subtraction and vice-versa. Multiplication is the inverse of division and vice- versa.

Examples: $2x = 4$ $w + 7 = -1$ $3x + 11 = -13$

$\frac{x}{3} = 2$ $\frac{x}{6} + 1 = 0$ $4x = 12$

26. Remember your integer rules. Adding integers: you simply add and keep the sign. Subtracting integers: you must leave, change, opposite and keep the sign of the number with the greatest absolute value.

When multiplying or dividing integers, the following rules apply:

| | | | | |
|---|---|---|---|---|
| Positive | x | Positive | = | Positive |
| Negative | x | Negative | = | Positive |
| Positive | x | Negative | = | Negative |

27. Slopes intercept form—Y must be alone. Example: $3x + 8y = 24$ ($Y=mx+b$)

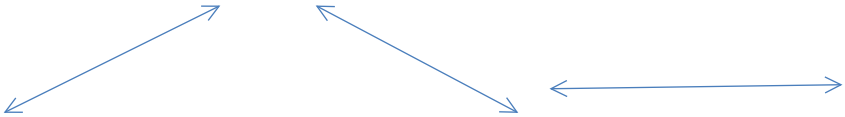
28. When solving an equation for a certain variable that variable must be alone. Example: Solve V = lwh for h.

29. A function must have only one output for each input.
30. A vertical line test will tell you if a graph is a function.
31. X or Y squared will not create a linear function.
32. To find the slope of a line, you must find two ordered pairs on the line. The formula is $\frac{y_2 - y_1}{x_2 - x_1}$. When given a graph, use two points that are on the line or create a right triangle and use $\frac{Rise}{Run}$
33. Remember to graph a line- start with your y-intercept; then, rise over run. If the slope is positive you will rise. If it is negative you will drop then run.
34. Solving systems of equations can be completed by substitution or elimination. Substitution: You must get the first equation in slope intercept form (revised equation); then, you must substitute the revised equation for "y" in the second equation. Solve for x and y. Elimination: you must put the equations in columns. Then, eliminate one of the variables (x or y) by making one column negative and one positive opposite. Examples: 3x + 2y = 7
    – 2y + 4x = 0

Elimination Substitution

## Statistics and Probability 12%

Scatter Plots is a graph in which ordered pairs of data are plotted. It is use to determine a relationship between two sets of data. Remember to follow the direction of the line.



Positive Negative No relationship

**Remember that the process of elimination works. Think about what you know about the problem. Eliminate all unreasonable answers. Plug in solutions to equations to make sure that they balance out. If they do not balance out they are not the solution set for that problem.**