

MATH 5 — PREREQUISITES FOR MATH 6

1. PROGRAM

- Algebraic expressions. Commutativity, associativity, distributivity.
- Equations. Solving word problems with equations.
- Powers of 2.
- Binary numbers.
- Powers. Negative powers. Scientific notation.
- $a^2 - b^2 = (a - b)(a + b)$
- Square roots.
- Pythagorean theorem.
- Basic probability theory: addition rule, complement rule, product rule.
- Geometry: parallel lines and angles (alternate interior, alternate exterior, corresponding).
- Parallelogram, various definitions, properties.
- Congruence tests for triangles (SAS, ASA, SSS).
- Isosceles triangle. Median, bisector, height.
- Trapezoid. Its midline. Area.

2. HOMEWORK 2

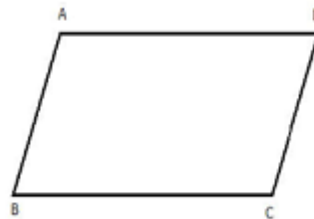
1. Let $a = 2 \cdot 10^8$, $b = 10^5$. Compute $a^2 \cdot b$, $\frac{a}{b}$, $a^2 \div b^3$.
2. If $a = 2^{-13}3^9$, $b = 2^{11}3^{-7}$, what is the value of ab ? of a/b ?
3. Write the following numbers using scientific notation.
 - (a) the distance from Earth to Pluto is $\approx 7,527,000,000$ km;
 - (b) the distance from Earth to the star Sirius is $\approx 81,900,000,000,000$ km;
4. Factor the following number into primes: $99^2 - 9^2$. [Hint: you do not have to compute this number.]
5. Find the following square roots. If you can not find the number exactly, at least say between which two whole numbers the answer is, e.g., between 5 and 6.
 - (a) $\sqrt{81}$
 - (b) $\sqrt{10,000}$
 - (c) $\sqrt{10^8}$
6. If, in a right triangle, one leg has length 1 and the hypotenuse has length 2, what is the other leg?
7. Simplify: $(\sqrt{17})^2$, $(\sqrt{13})^4$, $(\sqrt{11})^3$, $\sqrt{2^4 3^6}$, $\sqrt{2^4 3^5}$.
8. A license plate consists of 3 letters, followed by three digits. How many possible license plates are there?
9. We roll two identical dice. What is the probability of getting 1 and 3?
10. We roll two identical dice. What is the probability of getting sum of two numbers equal to 4?
11. If we toss a coin 5 times, what is the probability that **at least one** will be heads?
12. Solve equations:

(a) $\frac{3}{8}x = \frac{1}{3}$

(b) $|2x - 5| = 1$

(c) $\frac{(x-2)}{x-1} = 3$

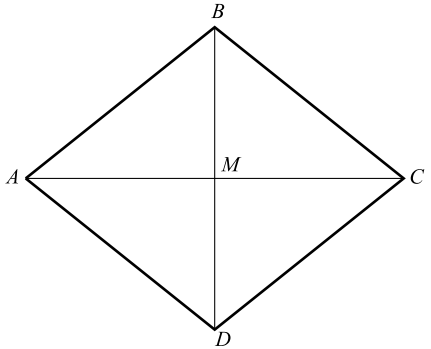
13. Show that in a parallelogram, diagonally opposite angles are equal $\angle A = \angle C$, $\angle B = \angle D$



14. Let $ABCD$ be a quadrilateral such that $AB = BC = CD = AD$ (such a quadrilateral is called rhombus). Let M be the intersection point of AC and BD .

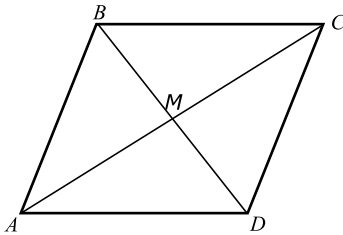
- Show that $\triangle ABC \cong \triangle ADC$
- Show that $\triangle AMB \cong \triangle AMD$
- Show that the diagonals are perpendicular and that the point M is the midpoint of each of the diagonals.

[Hint: after doing each part, mark on the figure all the information you have found — which angles are equal, which line segments are equal, etc: you may need this information for the following parts.]



15. Let $ABCD$ be a quadrilateral such that sides AB and CD are parallel and equal (but we do not know whether sides AD and BC are parallel).

- Show that triangles $\triangle AMB$ and $\triangle CMD$ are congruent.
- Show that sides AD and BC are indeed parallel and therefore $ABCD$ is a parallelogram.



16. Let $ABCD$ be a parallelogram, and let BE, CF be perpendiculars from B, C to the line AD .

- Show that triangles $\triangle ABE$ and $\triangle DCF$ are congruent.
- Show that the area of parallelogram is equal to height \times base, i.e. $BE \times AD$.

