

UBC Grade 11/12 Problems 1992

1. B.C. Transit is concerned about losing money in 1992. It estimates that if the basic fare is \$1.50, it would carry 250,000 passengers per day, and that for each increase of 10 cents beyond \$1.50 it would lose 10,000 passengers per day. What fare will maximise the daily revenue, how many passengers will be carried, and what will be the resulting daily revenue?

2. Find all x such that $\frac{x^2 - 5x + 6}{x^2 - 11x + 30} < 0$.

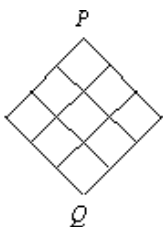
3. Solve the inequality: $\left| \frac{3x - 8}{2} \right| \geq 4$.

4. Prove that the following formula for changing the base of a logarithm is valid:

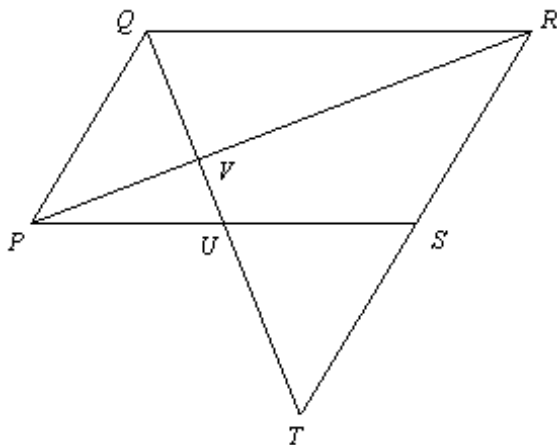
$$\log_b N = \frac{\log_a N}{\log_a b}$$

5. To number the pages of a book, a printer used 1980 digits. How many pages does the book have?
6. One hour from its origin of Kamloops, the locomotive of a CP freight train develops trouble that slows its speed to $\frac{3}{5}$ of its average speed up to the time of failure. Continuing at this reduced speed, it reaches its destination two hours late. Had the trouble occurred 50 km beyond its breakdown point, the delay would have been reduced by 40 minutes. Find the distance from Kamloops to the destination.
7. Consider the equation $kx^2 + y^2 = 4$, k a real number. For different values of k , identify the types of graphs represented by the equation. Sketch the graphs.
8. ABC is a triangle for which $BC = 4$ cm, $CA = 5$ cm, $AB = 6$ cm. Determine the ratio C/A of the angles C and A .

9. Simplify: $p = (1 + 4)(1 + 4^2)(1 + 4^4)(1 + 4^8)(1 + 4^{16})(1 + 4^{32})$.
10. If only downward motion along lines is allowed, what is the total number of paths from point P to point Q in the figure shown?



11. If $100!$ is multiplied out and written in decimal notation, how many zeros would there be at the end of the number?
12. Alice, Bob, and Carol repeatedly take turns tossing a die. Alice begins; Bob always follows Alice; Carol always follows Bob; and Alice always follows Carol. Find the probability that Carol will be the first one to toss a six.
13. $PQRS$ is a parallelogram as shown. QT meets PR at V , PS at U , and RS at T . If $QU = 3$ cm and $QT = 6$ cm, find the length of QV .



14. An archway is constructed on a straight base PQ with two circular arcs PR and QR . Arc PR has centre Q and arc QR has centre P . If the length of PQ is two meters, find the area under the archway.

