

Teachers' Guide
Preparing Students
for the
High School Proficiency Exam
in
Mathematics



Materials at your school:

- 2 Notebooks: Proficiency Materials
- Secondary Proficiency Materials for Mathematics
- Two released versions of the proficiency exams
- Set of 9 video tapes
- Posters
- Computer Instruction/practice tests

The High School Proficiency Preparation Plan suggests that one of the released versions of the High School Proficiency Exams be administered to students, the tests graded, an item analysis performed, and based upon that item analysis teachers would use the second review period (5 to 7 minutes per day) incorporated in the *Components of an Effective Lesson* to prepare students for this exam.

It's important that concepts are taught as opposed to problems being memorized. If students do not understand the concept, any variation in problem may cause students difficulty. See attached Problem Variation.

The following topics have been identified as areas causing students difficulty on past exams. Classroom teachers might use these as a guide to how questions might be asked and hints about how students might go about answering those questions.

Ratio & Proportion

Ratio & Proportion should be stressed as a problem-solving tool. Teachers should teach the students to *look* for ratios as they are reading a problem. Students should be required to write out the ratio. Teachers should show the students how to set up a proportion, making sure the ratio on the left side of the equal sign is the same as the ratio on the right side.

Two Kinds of Proportion Problems

Type I

A ratio is given in the problem, then more information is given in terms of the ratio.

Solve that by equivalent fractions or by cross-multiplying.

Type II

A ratio is given in a problem, then more information is given NOT in terms of the ratio.

Solve that algebraically.

Percents

The Percent Proportion should be stressed when a percentage is involved in a word problem. Students should be required to write the ratio given in word form, then fill in the Percent Proportion.

Students should solve these problems by equivalent fractions or by cross-multiplying. Again, the ratio on the left should be the same as the ratio on the right side of the equal sign.

Probability

When students are asked to find a probability, they should quickly identify if it is a simple or multi-stage problem.

If its simple, only one experiment (action) is taking place, students should count the number of ways they can be successful and place that result over the total number of possible things that might occur.

If the problem is multi-stage (more than one thing happening). Students should draw a tree diagram to list all the possibilities.

Statistics

Students should be able to find the mean, median, and mode. They should know more than just the procedure for finding the mean (adding & dividing).

When finding the mean, students should remember they are redistributing the total number of points. Key to their understanding is knowing the TOTAL.

They should also know that the median is used in financial circumstances and that the scores must be arranged in order when finding the MIDDLE score.

Students should also be able to determine that information by looking at a bar graph.

Counting

When students see the key words “how many different ways...”, they should MULTIPLY using the Fundamental Counting Principle

Graphing

Students should be able to make a circle graph by finding the measure of a central angle. Key is they take a fractional of 360° .

Additionally, students should be able to read or construct Stem & Leaf graphs by looking at the scores grouped by tens.

Students should be able to construct or read a Box & Whisker plots by using medians. MIDDLE of the entire group, MIDDLE of upper half, MIDDLE of lower half. Again, for a Box & Whisker, the data must be arranged in order.

Angles

Students should be able to classify angles as acute, right, obtuse, straight, or reflex. They should know angle pairs; adjacent, complementary, supplementary, and vertical.

Angles formed by Parallel Lines

They should be able to identify angles pairs formed by lines being cut by a transversal and know their relationships when the lines being cut are parallel. Angles such as corresponding, alternate interior, alternate exterior, and same side interior.

HINT – if students can not remember the relationship, generally angles are either EQUAL or their sum is 180° . If the angles look equal – set them equal. If they do not look equal, set their sum equal to 180°

Angles Associated with Polygons

Students should know the sum of the interior angles of a triangle is 180 degrees. The exterior angle is equal to the sum of the two remote interior angles.

The sum of the interior angles of a polygon is given by $(n-2)180$, where n represents the number of sides and $(n-2)$ represents the number of triangles formed. The sum of the exterior angles is 360° .

Angles Associated with Circles

In a circle, the measure of a central angle (vertex at center) is equal to the measure of its intercepted arc. An inscribed angle (vertex on the circle) is equal to half the intercepted arc.

Area – Volume

Students should know the area formulas for rectangles, parallelograms, triangles, and circles. They should be able to use those formulas to find areas of irregular shapes or shaded regions.

HINT – when asked to find the area or volume, students need to MULTIPLY.

Students should know the relationship between the area formulas and the volumes of prisms and pyramids.

Remind students that to find area you always multiply, to find perimeters you add.

Additionally, students traditionally mix up the formulas for area and circumference. $C=2\pi r$ and $A=\pi r^2$ (SQUARED). Make sure the students remember when they are finding area, they are determining how many squares fit inside a region, which formula has the word SQUARE in it?

Transformations

Students should be able to identify a reflection, rotation, and translation.

Pythagorean Theorem

Students should be able to use the Pythagorean Theorem to find things such as the distance between two points, the heights of ladders or cones.

HINT - Anytime a right triangle can be formed, students should think of the Pythagorean Theorem

Algebra

When solving word problems, sometimes it is just as easy to plug in the possible answers to see which work as opposed to solving the problem outright.

Linear Equations

Students should be able to evaluate algebraic expressions using the Order of Operations.

Students should be able to solve linear equations by using the Order of Operations in reverse using the opposite operation.

Students should be able to find the slope of a line by formula or by looking at a graph.

Systems of Equations

The easiest way to solve a system of equations on the HSPE is to plug in the ordered pairs to see which one works.

Quadratic Equations

Students should be able to solve a quadratic equation without a linear term by taking the square root.

Students should be able to solve quadratic equations when the coefficient of the quadratic term is ONE by factoring and using the Zero Product Property.

Sequences

Arithmetic sequences are nothing more than skip counting. If students are asked to find the n th term of a sequence in algebraic notation, they should just check each answer.

If they are given a sequence of numbers and asked to find the n th term, they should determine how many times they are adding the constant and add that to the first term.

Vocabulary & Notation

Spend time teaching vocabulary and notation explicitly. Too often students are missing problems they know how to do but get them incorrect because they did not understand the question. As you teach, be sure to use the more formal terminology students will see on the test.

Examples;

When students see the word “mean”, they should be translating that to redistributed total.
When students are asked about a Box & Whisker Plot or finding the median, they need to think of “middle after arranging scores”

When students are asked to find a probability, they need to think of a tree diagram