

# High School Level Mathematics Assessment

## Multiple Choice Items

The PSSA Mathematics Assessment is given in grades 3 through 8 and 11.

- Look at the mathematics terms included – you should know these for the PSSA
- Look at the formulas included in your handout – they will be provided, but you must know how to use them
- Practice using the sample questions included here – your teacher has the correct answers
- Read the question several times and underline or highlight important information
- Try to solve the math question before you look at the answer choices so you are not fooled by any answer choices
- Use the test book and extra paper to do your work
  - ❑ work slowly and neatly so you don't make any mistakes
  - ❑ check your mental math
  - ❑ write carefully and keep numbers in proper columns
  - ❑ copy carefully from the question
  - ❑ look carefully at the units of measurement
  - ❑ draw a picture of the problem if it will help you
  - ❑ if you don't get the right answer, don't give up – try again, or try to solve the problem a different way
  - ❑ if all else fails, try each answer choice - see which works to answer the question
- You may have to use all the information in the question - but be careful, some extra information may be included which is *not* needed to solve the problem - ignore that unnecessary information
- You will be able to use a calculator for some of the questions but not for all of them
- **Use** the calculator in the calculator section to check your answers
- Read all the answers carefully
- Watch out for trick answer choices - read the question carefully and choose the right math operation
- When you finish the section, go back and check your work

# Mathematics Assessment

## Open Ended Items (Performance)

- Look at the sample question included here and practice using the rubric
- Look at the Sample Response for Category 5 included here as a model of a great response
- This is not multiple choice – you must provide the answer
- Use the rubric if necessary while you solve the problem
- There are only a few of these questions, but they make up an important part of your score – **do not** skip these questions
- Do what you can, because you can get partial credit even if you make mistakes
- Read the question carefully, highlight important parts, and take your time
- Pay attention to how many solutions are required, and before you begin writing, divide your page so you will have enough space for all your work
- Write neatly
- Be sure to show all your work even if you use a calculator
- If you used a calculator, explain what you did on the calculator (for example, “I entered 3 multiplied by 3 and I got 9 as the product.”)
- Explain every step of your math and why you chose to perform that math – make sure that your explanation is easy for somebody else to read and understand
- Try to use these words when you write your explanation:
  - to get
  - to find
  - to figure out
  - to show
  - because
  - since
  - therefore
- you may want to make two columns on the answer page like this:

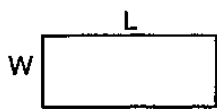
WORK	EXPLANATION
show the math calculations, the numbers, and the solutions here	use words to describe <b>each step</b> of your work here

***Terms used in the Academic Standards for Mathematics through Grade 11***

1. Absolute Value
  2. Analytic Geometry
  3. Arc
  4. Arithmetic Series
  5. Chord
  6. Cluster Sampling
  7. Compound Event
  8. Consistent, Inconsistent (System of Equations)
  9. Control Group
  10. Deductive Proof
  11. Direct Proof
  12. Domain
  13. Ellipse
  14. Estimation
  15. Experimental Design
  16. Extrapolation
  17. Finding Roots
  18. Finite Sequence
  19. Hyperbola
  20. Indirect Proof
  21. Infinite Geometric Series
  22. Intercept
  23. Interpolation
  24. Lines, Curves of Best Fit
  25. Logarithm
  26. Matrices
  27. Normal Curve
  28. Odds
  29. Opposite
  30. Parabola
  31. Proof by Contradiction
  32. Radian
  33. Raising to a Power
  34. Rates of Growth/Decay
  35. Reciprocal
  36. Regression
  37. Regression Equation of Best Fit
  38. Secant
  39. Sequences of Areas
  40. Series
  41. Simple Event
  42. Standard Deviation
  43. Statistical Measures of Center, Spread
  44. Tangent
  45. Treatment Group
  46. Trigonometric Functions
  47. Truth Table
  48. t-Test
  49. Two-Way Table
  50. Validity of an Argument
  51. Variance
  52. z-score
-

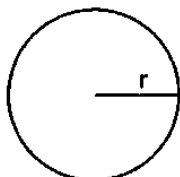
# GRADE 11 FORMULA SHEET

Formulas that you may need to work questions on this test are found below. You may refer to this page at any time during the test. A calculator may be used on this test. You may use calculator  $\pi$  or the number 3.14.

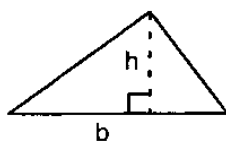


$$A = LW$$

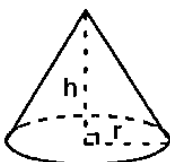
$$P = 2L + 2W$$



$$C = 2\pi r \quad A = \pi r^2$$

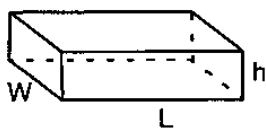


$$A = \frac{1}{2}bh$$



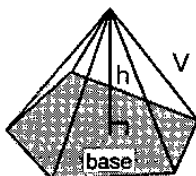
$$A = \pi r^2 + \pi r \sqrt{r^2 + h^2}$$

$$V = \frac{1}{3}\pi r^2 h$$

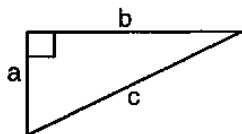


$$A = 2LW + 2Lh + 2Wh$$

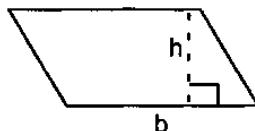
$$V = LWh$$



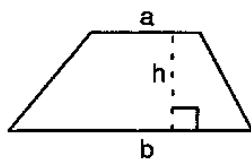
$$V = \frac{1}{3} (\text{Area of the base}) \times (\text{Height})$$



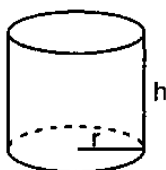
$$a^2 + b^2 = c^2$$



$$A = bh$$

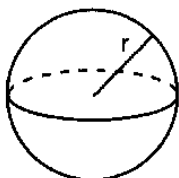


$$A = \frac{h}{2}(a + b)$$



$$A = 2\pi r^2 + 2\pi rh$$

$$V = \pi r^2 h$$



$$A = 4\pi r^2 \quad V = \frac{4}{3}\pi r^3$$

Constant Motion

$$d = rt$$

Simple Interest

$$I = prt$$

Quadratic Formula

$$\text{If } ax^2 + bx + c = 0, \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Compounding Interest  
(n times per year)

$$\text{Amount} = p(1 + \frac{r}{n})^n$$

Permutations

$$P(n, r) = \frac{n!}{(n-r)!}$$

Combinations

$$C(n, r) = \frac{n!}{r!(n-r)!}$$

Standard Deviation

$$\sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{N}}$$

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Nth Term of an Arithmetic Sequence  $a_n = a + (n-1)d$

Nth Term of a Geometric Sequence  $a_n = ar^{n-1}$

Sum of an Arithmetic Series  $S_n = \frac{n}{2}[2a + (n-1)d]$

Sum of a Geometric Series

$$S_n = \frac{a - ar^n}{1 - r} \quad \text{or} \quad S_n = \frac{a(1 - r^n)}{1 - r}$$

Sum of an Infinite Geometric Series

$$S = \frac{a}{1 - r}$$

$$\log_b x = \frac{\log_c x}{\log_c b}$$

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

$$z = \frac{x - \mu}{\sigma}$$

You may not use a calculator for items 1–3.

1. Mrs. Ditters and her daughter went to lunch. Their bill came to \$27.29. If a fair tip is between 15 and 20 percent, what would be a fair tip to leave their waiter?

A. \$ 2.00  
B. \$ 2.72  
C. \$ 5.00  
D. \$20.00

2. Add and simplify.

$$\begin{array}{r} 2\frac{3}{4} \\ + 5\frac{1}{3} \\ \hline \end{array}$$

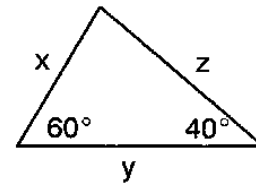
A.  $7\frac{1}{12}$   
B.  $7\frac{4}{7}$   
C.  $8\frac{1}{12}$   
D.  $8\frac{12}{13}$

3. If the rate of tax is 6%, find the tax on a bicycle that costs \$90.00.

A. \$ 15.00  
B. \$ 6.00  
C. \$ .54  
D. \$ 5.40

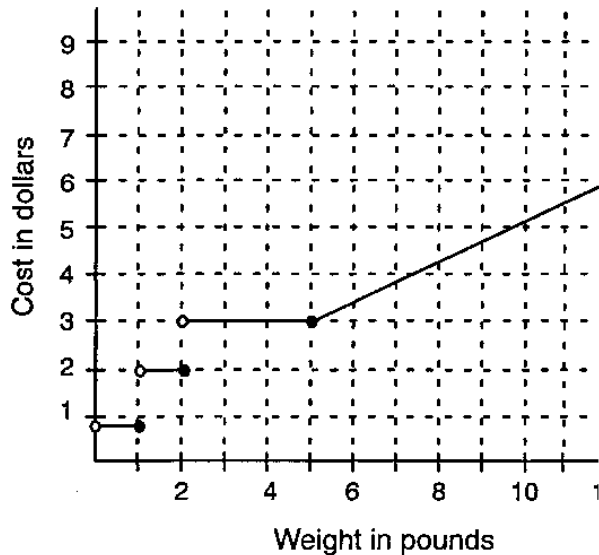
You may use a calculator for the rest of the questions on this test.

4. Classify the triangle.



- A. scalene, obtuse  
B. isosceles, acute  
C. scalene, acute  
D. isosceles, right
5. Sam works after school and earns \$4.50 an hour. Which sentence describes Sam's weekly pay ( $p$ ) if he works different hours ( $h$ ) each week?
- A.  $ph = 4.50$   
B.  $p = 4.50h$   
C.  $h = 4.50p$   
D.  $p = h$

6. The graph below represents the cost of shipping a package. What is the approximate difference in cost of shipping 2 five-pound packages as opposed to 1 ten-pound package?



- A. \$1  
 B. \$2  
 C. \$8  
 D. \$6
7. Which equation describes the relationship in the table?

x	y
1	3
2	6
3	11
4	18

- A.  $y = x + 4$   
 B.  $y = 2x^2$   
 C.  $y = 3x$   
 D.  $y = x^2 + 2$

8. A ruler is marked in eighths of an inch. Between which of the following marks would 0.66 inches be located?

- A.  $\frac{1}{4}$  and  $\frac{3}{8}$   
 B.  $\frac{5}{8}$  and  $\frac{3}{4}$   
 C.  $\frac{1}{2}$  and  $\frac{5}{8}$   
 D.  $\frac{3}{8}$  and  $\frac{1}{2}$

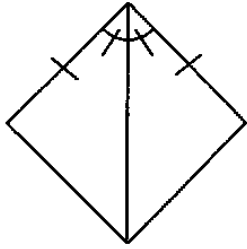
9. The junior high school student council has decided to add three students for an "at large" position that would represent the student body. These new members will not be elected but will be selected by a random drawing. Which is the **best** method for determining the new members?

- A. Randomly pick three names from the honor roll.  
 B. Randomly pick three names of students involved in extracurricular activities.  
 C. Randomly pick three names from the absentee list.  
 D. Randomly pick three names from the school enrollment list.

10. The Bucko Belt Company is valued at 2 million dollars. The Federal debt is at least 327 billion dollars. Approximately how many companies with a value equal to Bucko would it take to equal the Federal debt?

- A. 163  
 B. 1,630  
 C. 16,300  
 D. 163,000

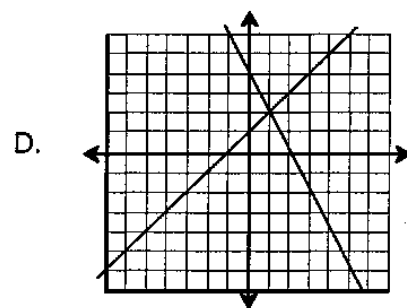
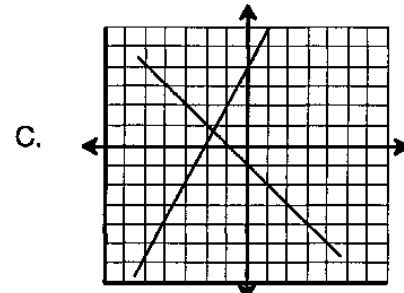
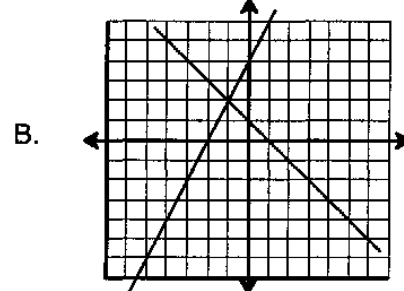
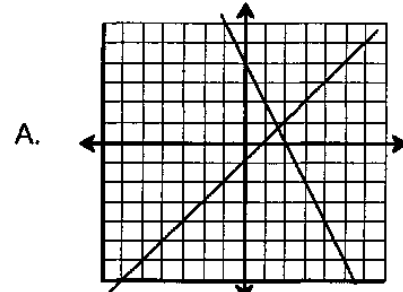
11. If enough information is given, which postulate or theorem verifies the congruence of the triangles shown?



- A. SSS  
 B. SAS  
 C. AAS  
 D. Not enough information has been given.
12. A prolific saver of pennies has  $N = 3^t$  pennies after  $t$  days. Solve:  $6500 = 3^t$  to find how many days until at least \$65 is saved.
- A. 8 days  
 B. 18 days  
 C. 186 days  
 D. 2166 days

13. Which figure shows the graphic solution to the equations below?

$$\begin{cases} y = x + 1 \\ y = -2x + 4 \end{cases}$$



14. In a group of 10 people, 7 people speak English, 4 speak French and 2 speak neither of the two languages. How many people speak both languages?

A. 1  
B. 2  
C. 3  
D. 4

15. Kim needs a certain shade of pink paint for a handmade toy. This shade is made by mixing white and red paint in a ratio of 1 to 3. How many fluid ounces of **red paint** would be needed to make 12 fluid ounces of this pink paint?

A. 4 fluid ounces  
B. 6 fluid ounces  
C. 8 fluid ounces  
D. 9 fluid ounces

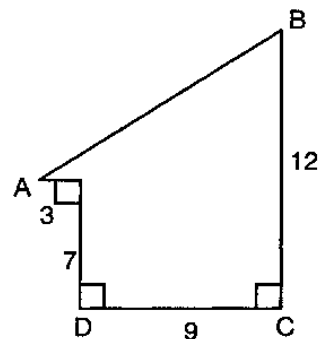
16. At the start of the month, the counter on the copy machine read 6,583. At the end of the month, it read 82,110. The copies cost  $1\frac{1}{3}$  cents a piece. What was the approximate total cost of the copies for this month?

A. \$10,000.00  
B. \$ 2,200.00  
C. \$ 1,000.00  
D. \$ 200.00

17. A square has an area of 16 square meters. Find the length of the diagonal.

A. 8  
B. 4  
C.  $4\sqrt{2}$   
D.  $8\sqrt{2}$

18. Find the length of segment AB in the figure below.



Note: Figure is **NOT** drawn to scale.

A. 8  
B. 13  
C. 14  
D. 15

19. Which of the following represents the largest value?

A.  $10^3$   
B.  $(5 + 5) \times 10$   
C.  $\frac{10^8}{10^2}$   
D.  $10^3 \times (10)^2$

20. If the range of a set of data is 110 and the lowest number in the data set is 98, what is the **greatest** number of that data set?
- A. 104  
 B. 110  
 C. 198  
 D. 208

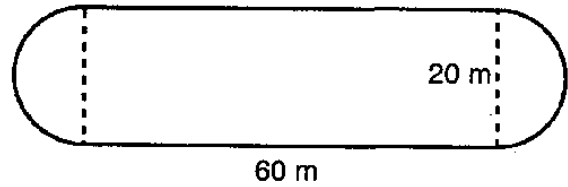
21. A case of spring water contains 24 bottles. If each bottle contains 330 milliliters, how many liters of spring water are in a case?
- A. 0.792 liters  
 B. 7.92 liters  
 C. 79.2 liters  
 D. 7920 liters

22. As part of her pay, a real estate agent is given a commission which is a percentage of the sale price. What is her total commission on a farm which sold for \$1,750,000? The rates are as follows:

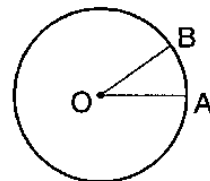
Sale Price	Commission
First \$500,000	8%
Any portion over \$500,000	5%

- A. \$ 87,500  
 B. \$100,000  
 C. \$102,500  
 D. \$140,000

23. The inside rail of a running track consists of a rectangle with a semicircle at each end as shown in the figure below. Find the approximate area surrounded by the track rail.



- A. 1200 m<sup>2</sup>  
 B. 2456 m<sup>2</sup>  
 C. 1514 m<sup>2</sup>  
 D. 160 m<sup>2</sup>
24. The population of a town is currently 35,000 people. If the population of the town increases at a rate of 5% per year, what will be the approximate population of the town in 15 years?
- A. 40,000 people  
 B. 50,000 people  
 C. 75,000 people  
 D. 175,000 people
25. The circle below has a diameter of 98 units.  $\widehat{AB}$  on the circle has a length of 38.5 units. What is the measure of  $\angle AOB$ ?



- A. 45°  
 B. 50°  
 C. 55°  
 D. 60°

26. What is the next term in the sequence below?

1, 8, 27, 64, . . .

- A. 5  
B. 25  
C. 96  
D. 125
27. In a high school, there are 210 sophomores, 200 juniors and 190 seniors. A survey was taken to determine the various activities in which the students were interested. A chart was prepared to show the results of the survey. A student from the high school is chosen at random. What is the probability that the student would prefer basketball over the other five sports listed?

Preferences			
Sport	So	Jr	Sr
Football	12	15	10
Basketball	8	10	12
Baseball	8	4	6
Swimming	4	3	4
Track	6	5	4
Hockey	4	3	2
Totals	42	40	38

- A. 0.300  
B. 0.250  
C. 0.083  
D. 0.050

28. Peg always complains that she has a million things to do. If she would take just 2 minutes to do each thing, approximately how long would it take her to do the million things?

- A. 140 days  
B. 55 months  
C. 30 hours  
D. 4 years

29. Given the following statements:

1. Judy Smith is a student at Deerfield High.
2. All students at Deerfield High are between 13 and 19 years of age.
3. Judy Smith is between 13 and 19 years of age.

Arrange the three statements into a logical sequence. Determine which statement(s) could be your conclusion.

- A. only statement number 1  
B. only statement number 2  
C. only statement number 3  
D. statement numbers 2 or 3

**Figure 3**  
**Mathematics General Problem Solving Rubric**

**5 - Advanced Understanding, Excellent**

- Correct answer with correct procedures/correct calculations shown or described and a written explanation that supports the work shown. The explanation tells what was done in the solution process and explains **why** the steps were done (or the reason(s) for the steps to be taken). No blemishes, that is, everything is correct. May have a minor omission in calculation or explanation where the omitted step or explanation may be of the level of  $2 + 2 = 4$  (something that is usually done mentally and considered trivial and understood).

**4 - Satisfactory Understanding**

- Correct answer with correct procedures/correct calculations shown or described and a written explanation which supports some of the work shown. May have minor omission in calculation or explanation (such as  $2 + 2 = 4$ ).

**3 - Almost Satisfactory Understanding**

- Correct answer with most correct procedures/calculations shown or described and no explanation. Some steps are missing, but you can follow what is being done.
- Correct answer with few correct procedures/calculations shown or described and some explanation. Some steps are missing, but you can follow what is being done.
- Incorrect answer with correct procedures shown or described and some explanation, but with one calculation or copying error carried through.

**2 - Partial Understanding**

- Correct answer with few procedures/calculations shown or described or some explanation. Too many steps are missing to follow what is being done.
- Incorrect answer with half or more correct procedures shown or described and some or no explanation. The student either did not proceed far enough or proceeded incorrectly.
- Incorrect answer with correct procedures shown or described and no explanation. May have no more than 2 calculation or copying errors.

**1 - Minimal Understanding**

- Correct answer with calculations, procedures or explanation that are either not legible or not understandable or missing or the procedure is incorrect. Less than a "2" score.
- No answer or an incorrect answer, but the student has provided some of the information critical to the solution. There is some indication that the student has read the item.

**0 - Incorrect**

- Incorrect answer in which the student attempts the task incorrectly or gives an incorrect or incomplete answer with an incorrect explanation or no explanation of the procedure or logic used in the solution. Nothing is correct.
  - Blank responses and Off-Task responses (profanity, refusal to perform, unrelated drawings or comments such as "doodles") are scored as "Incorrect responses."
  - Question marks and "I don't know" are scored as "Incorrect responses." The student has read the task and responded to it.
  - No answer is treated as an incorrect answer.
-

30. The Student Store sells physical education uniforms, **one style for boys** and **one style for girls**. The uniforms come in **4 different sizes**: small, medium, large and extra large.

All of the 850 incoming ninth-grade students, 450 of whom are girls, will need to buy these uniforms. The students, who run the school store, decide to conduct a survey with the incoming ninth-grade students to find out what sizes of each style to order.

The results of the survey are shown in the table. They plan to use this information to determine the specifics of the order for the uniforms. Use the results of the survey to find the **minimum** number of each size for girls **and** for boys that should be ordered for the incoming ninth-grade students.

	EXTRA LARGE	LARGE	MEDIUM	SMALL	TOTAL
GIRLS	2	10	36	12	60
BOYS	9	25	10	6	50

In the shaded area below, show your work and explain the steps you used to justify your answer. Numerical answers must always be labeled.

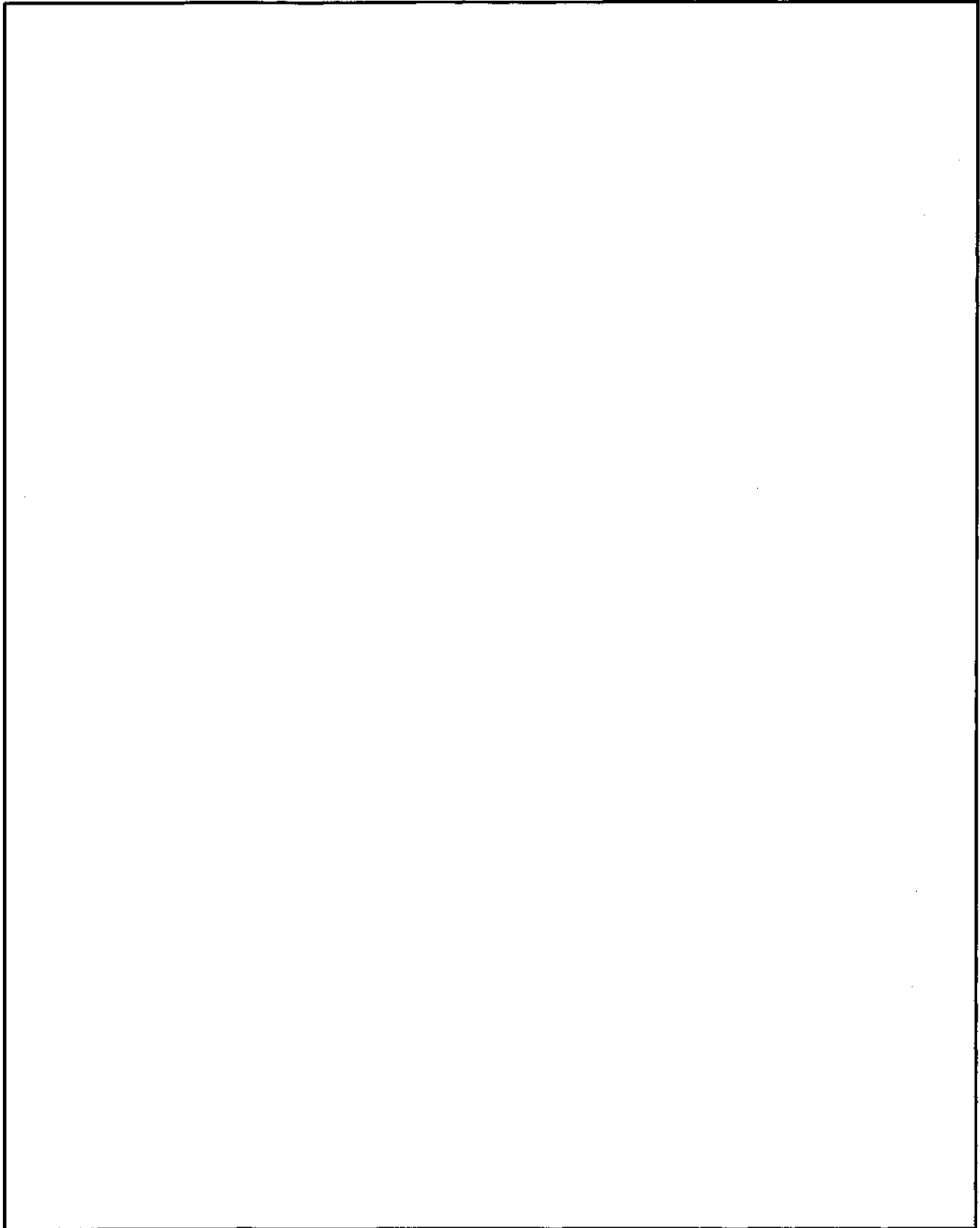
For full credit, you **must** do the following:

1. Show all the steps you used to solve the problem. If you used a calculator or did some of the work in your head, you must write a description of the steps that you followed.  
**AND**
2. Write an explanation stating the mathematical reason(s) **why** you chose each of your steps.

IF YOU NEED MORE SPACE, PLEASE USE NEXT PAGE.

**GO ON** 

30. *Continued.* If you need more space, use this page. Please refer to previous page for task explanation.



IF YOU NEED MORE SPACE, PLEASE USE NEXT PAGE.

**GO ON** 

**Grade 11 Sample Response for Category 5**

64. Dwyane and Jonra decided that they are going to make and sell pine cone wreaths to make some extra money. Their parents agree to let them use the garage to make the wreaths if they pay \$50 per month for electricity and heat. They estimate that they can make and sell 40 wreaths per month in the evenings and on weekends. They determine that the materials will cost about \$3.50 per wreath. Each one of them wants to make at least \$100 per month profit. What is the least amount Dwayne and Jonra must charge for each wreath?

For full credit, you must do the following:

1. Show all the steps you used to solve the problem. If you used a calculator or did some of the work in your head, you must write a description of the steps that you followed.

**AND**

2. Write an explanation stating the mathematical reason(s) why you chose each of your steps.

First we need to see how much they need to spend each month.

$$40 \text{ wreaths} \times 3.50 \text{ and } +50 \text{ for heat \& elec.}$$
$$140 + 50 = 190 \text{ dollars per month}$$

then to determine price we need to make an equation. if  $x$  is the price, then:

$$40x - \overset{+140}{\text{their expenses}} \geq \overset{+100}{\text{their added desired profit}} 200$$

$$40x \geq 390$$

$$x \geq 9.75$$

at least  $\$9.75$  they must charge for each wreath

5 - Response uses algebraic method by first calculating total production costs. An equation relating the income, less costs, to profits is constructed. The variable ( $x$ ) is defined and the correct answer (\$9.75) is found. All work is shown and clearly explained. The use of labeling is acceptable for the algebraic method when all parts of the equation are clearly defined.