

Math Grade 11 Assessment Anchors and Eligible Content



Pennsylvania Department of Education

www.pde.state.pa.us

2007

M11.A Numbers and Operations

Reporting Category

ASSESSMENT ANCHOR

M11.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.

ELIGIBLE CONTENT

M11.A.1.1 Represent and/or use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, square roots, exponents and scientific notation).

Reference: 2.1.8.A, 2.1.8.B, 2.1.11.A

~~M11.A.1.1.1~~ Represent and/or use fractions as decimals and percents (item may ask for 2 of any of these 3— change percent to fraction, change fraction to decimal, etc). Assessed at Grades 7 and 8.

M11.A.1.1.1 Find the square root of an integer to the nearest tenth using either a calculator or estimation. (Integer may or may not be a perfect square) – answer may be a range of values).

M11.A.1.1.2 Express numbers and/or simplify expressions using scientific notation (including numbers less than 1).

M11.A.1.1.3 Simplify square roots. (e.g., $\sqrt{24} = 2\sqrt{6}$)

EXAMPLE ITEMS

- The diameter of a red blood cell, in inches, is 3×10^{-4} . This expression is the same as which of the following numbers?

- A. 0.00003
- * B. 0.0003
- C. 0.003
- D. 3,000
- E. 30,000

(NAEP)

- $\frac{6 \times 10^3}{3 \times 10^5} =$

- A. 0.5×10^2
- B. 2×10^2
- C. $2 \times 10^{0.6}$
- D. 0.5×10^{-2}
- * E. 2×10^{-2}

(NAEP)

M11.A Numbers and Operations
Reporting Category**ASSESSMENT ANCHOR**

M11.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.

M11.A.1.2 Apply number theory concepts to show relationships between real numbers in problem solving settings.

Reference: 2.1.8.E

ELIGIBLE CONTENT

~~**M11.A.1.2.1** Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax^2+bx+c where a is not equal to 0).~~

Moved to 11.D.2.2.2

M11.A.1.2.1 Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials. and/or factor polynomial expressions using the greatest common monomial factor.

Included in A.1.2.1.

~~**M11.A.1.2.3** Simplify algebraic fractions.~~

Moved to 11.D.2.2.3.

EXAMPLE ITEMS

M11.A Numbers and Operations

Reporting Category

ASSESSMENT ANCHOR

M11.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.

M11.A.1.3 Estimate the value of an irrational number.

Reference: 2.2.8.C

ELIGIBLE CONTENT

M11.A.1.3.1 ~~Compare, order and/or plot~~
~~Locate/identify~~ irrational numbers at the approximate location on a number line.

M11.A.1.3.2 Compare and/or order any real numbers (rational and irrational may be mixed).

EXAMPLE ITEMS

M11.A Numbers and Operations**Reporting Category****ASSESSMENT ANCHOR**

M11.A.2 Understand the meanings of operations, use operations and understand how they relate to each other.

M11.A.2.1 Apply ratio and/or proportion in problem-solving situations.

Reference: 2.2.11.A, 2.8.11.P

ELIGIBLE CONTENT

M11.A.2.1.1 Solve problems using operations with rational numbers including rates and percents (single and multi-step and multiple procedure operations) (e.g., distance, work and mixture problems, etc.).

M11.A.2.1.2 Solve problems using direct and inverse proportions.

M11.A.2.1.3 Identify and/or use proportional relationships in problem solving settings.

EXAMPLE ITEMS

- Mr. Morris is making a dollhouse with toy furniture. He uses 0.5 inches to represent 1 foot. What would be the dimensions of a toy table representing a table 6 feet long, 3 feet wide and 30 inches high?
 - A. 3 inches long, 1.25 inches wide and 1.5 inches high
 - *B. 3 inches long, 1.5 inches wide and 1.25 inches high
 - C. 12 inches long, 6 inches wide and 5 inches high
 - D. 3 inches long, 1.5 inches wide and 15 inches high

(Pennsylvania Department of Education)

M11.A Numbers and Operations

Reporting Category

ASSESSMENT ANCHOR

M11.A.2 Understand the meanings of operations, use operations and understand how they relate to each other.

M11.A.2.2 Use exponents, roots and/or absolute value to solve problems.

Reference: 2.1.11.A

ELIGIBLE CONTENT

M11.A.2.2.1 Simplify/evaluate expressions involving positive and negative exponents, roots and/or absolute value (may contain all types of real numbers - exponents should not exceed power of 10).

M11.A.2.2.2 Simplify/evaluate expressions involving multiplying with exponents (e.g. $x^6 * x^7 = x^{13}$), powers of powers (e.g., $(x^6)^7 = x^{42}$) and powers of products $(2x^2)^3 = 8x^6$ (positive exponents only).

EXAMPLE ITEMS

M11.A Numbers and Operations

Reporting Category

ASSESSMENT ANCHOR**M11.A.3 Compute accurately and fluently and make reasonable estimates.****M11.A.3.1** Apply the order of operations in computation and in problem-solving situations.**Reference: 2.2.8.A****ELIGIBLE CONTENT****M11.A.3.1.1** Simplify/*evaluate* expressions using the order of operations to solve problems (any rational numbers may be used).

EXAMPLE ITEMS

M11.A Numbers and Operations

Reporting Category

ASSESSMENT ANCHOR

M11.A.3 Compute accurately and fluently and make reasonable estimates.

ELIGIBLE CONTENT

M11.A.3.2 Use estimation strategies in problem-solving situations.

Reference: 2.2.11.B, 2.2.11.D

~~M11.A.3.2.1 Use estimation to check reasonableness of calculations in problem-solving situations involving rational numbers (e.g., significant digits; rounding not to exceed 3 decimal places).~~

M11.A.3.2.1 Use estimation to solve problems for which an exact answer is not needed.

EXAMPLE ITEMS

- 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

(Pennsylvania Department of Education)

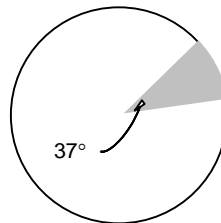
- Mrs. Ditters and her daughter went to lunch. Their bill came to \$27.29. If a fair tip is between 15 and 20 percent, what would be a fair tip to leave their waiter?

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

(Pennsylvania Department of Education)

- The entire circle shown below represents a total of 2,675 radios sold. Of the following, which is the best approximation of the number of radios represented by the shaded sector of the circle?

- B. 70
- * C. 275
- D. 985
- E. 25880
- F. 98420



(NAEP)

M11.B Measurement

Reporting Category

ASSESSMENT ANCHOR

M11.B.1 Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.

ELIGIBLE CONTENT

Not assessed at grade 11.

EXAMPLE ITEMS

M11.B Measurement

Reporting Category

ASSESSMENT ANCHOR

M11.B.2 Apply appropriate techniques, tools and formulas to determine measurements.

M11.B.2.1 Use and/or compare measurements of angles.

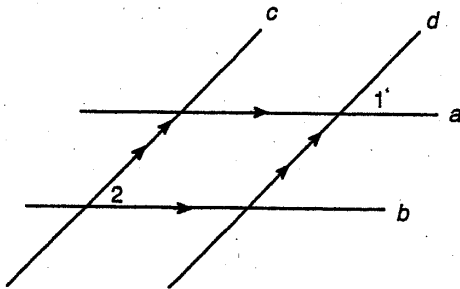
Reference: 2.3.11.A, 2.3.11.B

ELIGIBLE CONTENT

M11.B.2.1.1 Measure and/or compare angles in degrees (up to 360°) (protractor must be provided or drawn).~~M11.B.2.1.2 Classify, use or determine measurements of angles. (e.g., complementary, supplementary, alternate interior, alternate exterior, vertical, corresponding, etc.)~~

Moved to 11.C.1.2.4.

EXAMPLE ITEMS

Given: $a \parallel b$, $c \parallel d$ If $m \angle 1 = 2x + 16$ and $m \angle 2 = x + 14$, then what is the value of x ?

- A. -10
- * B. -2
- C. 2
- D. 10

(Pennsylvania Department of Education)

M11.B Measurement

Reporting Category

ASSESSMENT ANCHOR

M11.B.2 Apply appropriate techniques, tools and formulas to determine measurements.

M11.B.2.2 Use and/or develop procedures to determine or describe measures of perimeter, circumference, area, surface area and/or volume. (May require conversions within the same system.)

Reference: 2.3.8.A, 2.3.8.D

Delete Reference: 2.9.11.E

ELIGIBLE CONTENT

M11.B.2.2.1 Calculate the surface area ~~or volume~~ of prisms, cylinders, cones, pyramids and/or spheres. ~~using Formulas are provided~~ on the reference sheet.

M11.B.2.2.2 Calculate the volume of prisms, cylinders, cones, pyramids and/or spheres. Formulas are provided on the reference sheet.

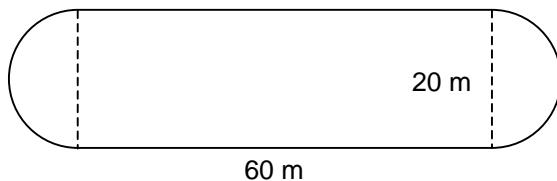
~~**M11.B.2.2.2** Find perimeter, circumference, or area of inscribed and/or circumscribed figures given whole number dimensions.~~

M11.B.2.2.3 Estimate ~~and/or determine~~ area, perimeter or circumference of ~~simple figures or an irregular~~ figure.

M11.B.2.2.4 Find the measurement of a missing length given the perimeter, circumference, area or volume.

EXAMPLE ITEMS

- 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^2
 B. 2456 m^2
 * C. 1514 m^2
 D. 160 m^2

(Pennsylvania Department of Education)

M11.B Measurement

Reporting Category

ASSESSMENT ANCHOR**M11.B.2 Apply appropriate techniques, tools and formulas to determine measurements.****ELIGIBLE CONTENT**

M11.B.2.3 Describe how a change in one dimension of a figure (2 or 3 dimensional) affects other measurements of that figure.

Reference: 2.3.8.E

M11.B.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, area or volume.

- How does changing the **length of the radius** of a circle affect the circumference of the circle?
- How does changing the **length of the edge** of a cube affect the volume of the cube?
- How does changing the **length of the base** of a triangle affect the area of the triangle?

EXAMPLE ITEMS

M11.C Geometry

Reporting Category

ASSESSMENT ANCHOR

M11.C.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.

M11.C.1.1 Identify and/or use parts of circles and segments associated with circles.

Reference: 2.9.11.F

ELIGIBLE CONTENT

M11.C.1.1.1 Identify and/or use the properties of a radius, diameter **chord**, and/or tangent **secant** of a circle (given numbers should be whole.)

M11.C.1.1.2 Identify and/or use the properties of arcs, semicircles, inscribed angles and/or central angles.

EXAMPLE ITEMS

M11.C Geometry

Reporting Category

ASSESSMENT ANCHOR

M11.C.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.

M11.C.1.2 Recognize and/or apply properties of angles, triangles and quadrilaterals.

Reference: 2.9.8.D, 2.9.11.C

ELIGIBLE CONTENT

M11.C.1.2.1 Identify and/or use properties of triangles (e.g., medians, altitudes, angle bisectors, side/angle relationships, Triangle Inequality Theorem).

M11.C.1.2.2 Identify and/or use properties of quadrilaterals (e.g., parallel sides, diagonals, bisectors, congruent sides/angles and supplementary angles).

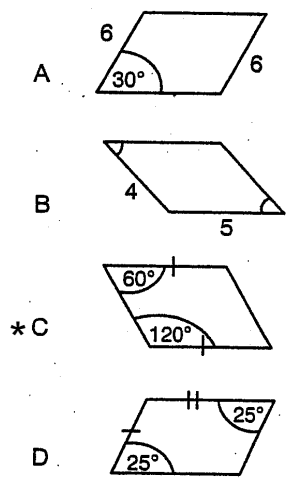
M11.C.1.2.3 Identify and/or use properties of isosceles and equilateral triangles

~~M11.C.1.2.4 Classify, use or determine measurements of angles (e.g., complementary, supplementary, alternate interior, alternate exterior, vertical, corresponding, etc.)~~

Assessed at Grade 8.

EXAMPLE ITEMS

- Which picture provides enough information to prove that the figure is a parallelogram?



(Pennsylvania Department of Education)

M11.C Geometry

Reporting Category

ASSESSMENT ANCHOR

M11.C.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.

ELIGIBLE CONTENT

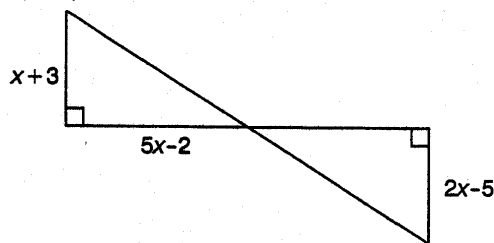
M11.C.1.3 Use properties of congruence, correspondence and similarity in problem-solving settings involving two- and three- dimensional figures.

Reference: 2.9.11.B

M11.C.1.3.1 Identify and/or use properties of congruent and similar polygons or solids.

EXAMPLE ITEMS

- Given that the triangles shown are congruent, find the value of x .



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

(Pennsylvania Department of Education)

M11.C Geometry

Reporting Category

ASSESSMENT ANCHOR

M11.C.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.

M11.C.1.4 Solve problems involving right triangles using the Pythagorean Theorem.

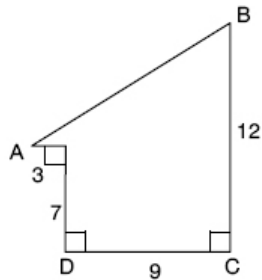
Reference: 2.10.11.B

ELIGIBLE CONTENT

M11.C.1.4.1 Find the measure of a side of a right triangle using the Pythagorean Theorem (Pythagorean Theorem included on the reference sheet).

EXAMPLE ITEMS

- 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

(Pennsylvania Department of Education)

M11.C Geometry

Reporting Category

ASSESSMENT ANCHOR

M11.C.2 Identify and/or apply concepts of transformations or symmetry.

ELIGIBLE CONTENT

Not assessed at grade 11.

EXAMPLE ITEMS

M11.C Geometry

Reporting Category

ASSESSMENT ANCHOR

M11.C.3 Locate points or describe relationships using the coordinate plane.

ELIGIBLE CONTENT

M11.C.3.1 Solve problems using analytic geometry.

Reference: 2.9.11.G

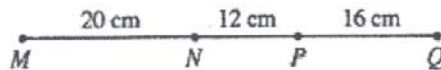
M11.C.3.1.1 Find Calculate the distance and/or midpoint between 2 points on a number line or on a coordinate plane (formula provided on the reference sheet).

M11.C.3.1.2 Relate slope to perpendicularity and/or parallelism (limit to linear algebraic expressions; slope formula provided on the reference sheet).

EXAMPLE ITEMS

- What is the distance between the points (2,10) and (-4,2) in the xy-plane?
 - A. 6
 - B. 8
 - * C. 10
 - D. 14
 - E. 18

(NAEP)



- What is the distance between the midpoint of MN and the midpoint of PQ shown above?
 - A. 18 cm
 - B. 24 cm
 - C. 26 cm
 - D. 28 cm
 - * E. 30 cm

(NAEP)

M11.D Algebraic Concepts

Reporting Category

ASSESSMENT ANCHOR

M11.D.1 Demonstrate an understanding of patterns, relations and functions.

M11.D.1.1 Analyze and/or use patterns or relations.
Reference: 2.8.11.Q, 2.8.11.A, 2.8.11.O

ELIGIBLE CONTENT

M11.D.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.

M11.D.1.1.2 Determine if a relation is a function given a set of points or a graph.

M11.D.1.1.3 Identify the domain, range or inverse of a relation (may be presented as ordered pairs or a table).

EXAMPLE ITEMS

- Which of the following best describes the pattern 4, 8, 12, ...?

- A. $1 + n, 4 + n, 8 + n, \dots$
- B. n^2, n^3, n^4, \dots
- * C. $n, 2n, 3n, \dots$
- D. $n, \frac{n}{2}, \frac{n}{3}, \dots$

(Pennsylvania Department of Education)

- What is the next term in the sequence below?

1, 8, 27, 64, ...

- A. 5
- B. 25
- C. 96
- * D. 125

(Pennsylvania Department of Education)



- If this pattern of dot-figures is continued, how many dots will be in the 100th figure?

- A. 100
- B. 101
- * C. 199
- D. 200
- E. 201

(NAEP)

M11.D Algebraic Concepts

Reporting Category

ASSESSMENT ANCHOR

M11.D.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

M11.D.2.1 Write, solve and/or graph linear equations and inequalities using various methods.

Reference: 2.8.8.F, 2.8.11.D,
2.8.11.H, 2.8.11.J,
2.8.11.N, 2.8.11.L,
2.8.11.K

ELIGIBLE CONTENT

M11.D.2.1.1 Solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).

M11.D.2.1.2 Identify or graph functions, linear equations or linear inequalities on a coordinate plane.

M11.D.2.1.3 Write, solve and/or apply a linear equation (including problem situations).

M11.D.2.1.4 Write and/or solve systems of equations using graphing, substitution and/or elimination (limit systems to 2 equations).

M11.D.2.1.5 Solve quadratic equations using factoring (integers only – not including completing the square or the Quadratic Formula).

EXAMPLE ITEMS

- If $f(x) = 5x - 3$ and $f(x) = 7$,
What is the value of x ?

- A. -3
- * B. 2
- C. 5
- D. 7

(Kentucky Department of Education)

- If $f(x) = \frac{2x+1}{3}$ and $g(x) = 2x^2 + 2$,
then $f(g(2)) =$

- A. 3
- B. 5
- * C. 7
- D. $7\frac{5}{9}$
- E. $16\frac{2}{3}$

(NAEP)

M11.D Algebraic Concepts

Reporting Category

ASSESSMENT ANCHOR

M11.D.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

M11.D.2.2 Simplify expressions involving polynomials.

Reference: 2.8.11.S

ELIGIBLE CONTENT

M11.D.2.2.1 Add, subtract and/or multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial).

M11.D.2.2.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax^2+bx+c where a is not equal to 0).

Moved from 11.A.1.2.1.

M11.D.2.2.3 Simplify algebraic fractions.

Moved from 11.A.1.2.3.

EXAMPLE ITEMS

M11.D Algebraic Concepts

Reporting Category

ASSESSMENT ANCHOR

M11.D.3 Analyze change in various contexts.

ELIGIBLE CONTENT

M11.D.3.1 Describe and/or determine change.

Reference: 2.8.8.J, 2.11.8.B

M11.D.3.1.1 Identify, describe and/or use constant or varying rates of change.

M11.D.3.1.2 Determine how a change in one variable relates to a change in a second variable (e.g., $y=4/x$, if x doubles, what happens to y ?).

EXAMPLE ITEMS

- Yearly college tuition increased from \$16,000 in 1996 to \$20,000 in the year 2000. What is the **annual** rate of increase?

- A. 2.5%
- *B. 5.7%
- C. 8%
- D. 20%

(Pennsylvania Department of Education)

- A certain culture of 5,000 bacteria triples every 43 minutes. Let B = the number of bacteria t minutes after the start of the count. Which equation models the situation?

- A. $B = 5000 + 43t$
- B. $B = 43t^2 + 5000$
- *C. $B = 5000 \cdot 3^{t/43}$
- D. $B = 5000 + 3 \cdot 43t$

(Pennsylvania Department of Education)

M11.D Algebraic Concepts

Reporting Category

ASSESSMENT ANCHOR

M11.D.3 Analyze change in various contexts.

M11.D.3.2 Compute and/or use the slope of a line.

Reference: 2.8.11.J, 2.8.11.L

ELIGIBLE CONTENT

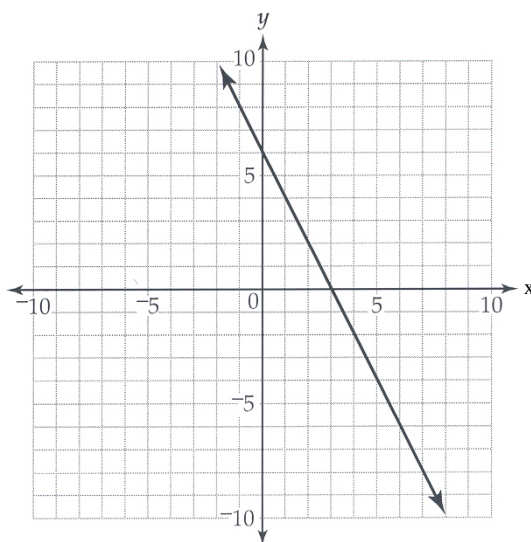
M11.D.3.2.1 Apply the formula for the slope of a line to solve problems (formula given on reference sheet).

M11.D.3.2.2 Given the graph of the line, 2 points on the line, or the slope and a point on a line, write or identify the linear equation in point-slope, standard and/or slope-intercept form.

M11.D.3.2.3 Compute the slope and/or y-intercept represented by a linear equation or graph.

EXAMPLE ITEMS

- Look at the line that is graphed below.



Which of these equations describes the line?

- * A. $y = -2x + 6$
- B. $y = -\frac{1}{2}x + 6$
- C. $y = \frac{1}{2}x + 6$
- D. $y = 2x + 6$

(Massachusetts Department of Education)

M11.D Algebraic Concepts

Reporting Category

ASSESSMENT ANCHOR

M11.D.4 Describe or use models to represent quantitative relationships.

ELIGIBLE CONTENT

M11.D.4.1 Interpret and/or use linear, quadratic and/or exponential functions and their equations, graphs or tables.

Reference: 2.8.11.K, 2.8.11.Q

Delete Reference: 2.11.11.A

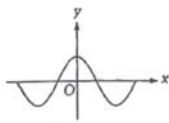
M11.D.4.1.1 Match the graph of a given function to its table or equation.

~~M11.D.4.1.2~~ Graph linear functions in two variables.

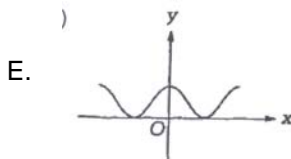
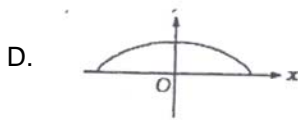
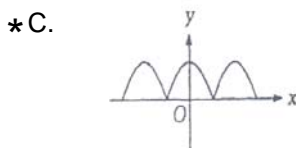
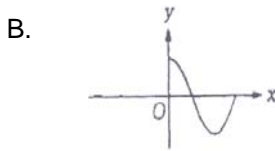
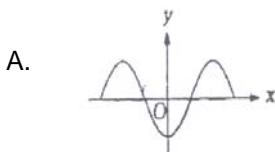
Included in 11D.2.1.2.

~~M11.D.4.1.3~~ Determine the maximum or minimum of a quadratic function.

EXAMPLE ITEMS



- The figure above shows the graph of $y = f(x)$. Which of the following could be the graph of $y = |f(x)|$?

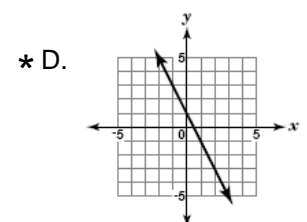
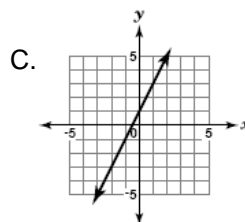
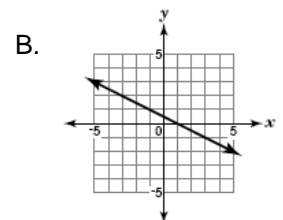
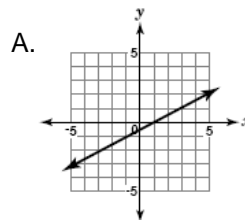


(NAEP)

- The table below shows a linear relationship between x and y .

x	-2	-1	0	1	2
y	5	3	1	-1	-3

Which of these graphs shows this relationship?



(Maryland Department of Education)

M11.E Data Analysis and Probability

Reporting Category

ASSESSMENT ANCHOR

M11.E.1 Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.

M11.E.1.1 Appropriately display and/or use data in problem-solving settings.

Reference: 2.6.11.A, 2.6.8.E

ELIGIBLE CONTENT

M11.E.1.1.1 Create and/or use appropriate graphical representations of data, including box-and-whisker plots, stem-and-leaf plots or scatter plots. ~~line, double line, bar, double bar and circle graphs.~~

M11.E.1.1.2 Analyze data and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots or scatter plots, ~~line and double line graphs, bar and double bar graphs and circle graphs.~~)

EXAMPLE ITEMS

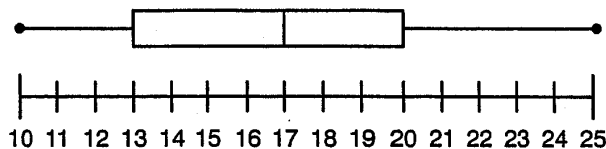
Year	Number of Traffic Deaths in Pennsylvania
1990	205
1991	
1992	191
1993	184

The above relationship is linear. Predict the number of highway deaths in the year 2005.

- A. 93
- *B. 100
- C. 107
- D. 114

(Pennsylvania Department of Education)

- Look at the box-and-whisker plot below. What range of values contains 50% of the data?



- A. 10 – 20
- B. 13 – 25
- *C. 17 – 25
- D. 17 – 20

(Pennsylvania Department of Education)

M11.E Data Analysis and Probability

Reporting Category

ASSESSMENT ANCHOR

M11.E.2 Select and/or use appropriate statistical methods to analyze data.

M11.E.2.1 Use measures of central tendency to describe a set of data.

Reference: 2.6.8.A, 2.6.11.A

ELIGIBLE CONTENT

M11.E.2.1.1 Calculate or select the appropriate measure of central tendency (mean, mode or median) of a set of data given or represented on a table, line plot or stem-and-leaf plot.

M11.E.2.1.2 Calculate and/or interpret the range, quartiles and interquartile range or measures of central tendency of sets of data.

M11.E.2.1.3 Describe how outliers affect measures of central tendency.

EXAMPLE ITEMS

- 12 | 9
- 13 | 3, 6, 7, 7
- 14 | 1, 1, 1, 1, 3, 4, 4, 6, 9, 9
- 15 | 0, 0, 0, 1, 2, 4, 6, 7, 8, 8, 8, 9
- 16 | 1, 6, 7

What is the median of the data recorded on the stem-and-leaf plot?

- A. 149
- * B. $149.\overline{5}$
- C. $149.\overline{6}$
- D. 150

(Pennsylvania Department of Education)

M11.E Data Analysis and Probability

Reporting Category

ASSESSMENT ANCHOR

M11.E.3 Understand and/or apply basic concepts of probability or outcomes.

ELIGIBLE CONTENT

M11.E.3.1 Apply probability and/or odds to practical situations.

Reference: 2.7.11.A, 2.7.11.E

M11.E.3.1.1 Find probabilities for independent, dependent or compound events and represent as a fraction, decimal or percent).

M11.E.3.1.2 Find, convert and/or compare the probability and/or odds of a simple event.

EXAMPLE ITEMS

- If the odds are 3 to 5 that a vehicle randomly selected from a parking lot is a truck, what is the probability that it is not a truck?

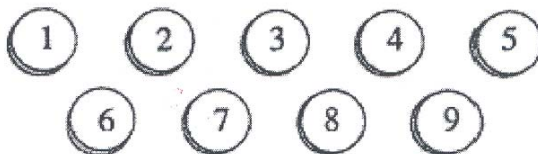
- A. 3 to 5
 B. 5 to 3
 C. $\frac{3}{8}$
 *D. $\frac{5}{8}$

(Pennsylvania Department of Education)

- The chance of rain is $\frac{2}{5}$. What are the odds against rain occurring?

- A. 2 to 3
 *B. 3 to 2
 C. $\frac{3}{8}$
 D. $\frac{2}{5}$

(Pennsylvania Department of Education)



- The nine chips shown above are placed in a sack and then mixed up. Madeline draws one chip from this sack. What is the probability that Madeline draws a chip with an even number?

- A. $\frac{1}{9}$ B. $\frac{2}{9}$ *C. $\frac{4}{9}$ D. $\frac{1}{2}$ E. $\frac{4}{5}$

(NAEP)

M11.E Data Analysis and Probability**Reporting Category****ASSESSMENT ANCHOR****M11.E.3 Understand and/or apply basic concepts of probability or outcomes.****M11.E.3.2** Apply counting techniques in problem-solving settings.*Reference: 2.7.8.A***ELIGIBLE CONTENT****M11.E.3.2.1** Determine the number of permutations and/or combinations or apply the fundamental counting principle. (Formula provided on the reference sheet).**EXAMPLE ITEMS**

- A contractor is building 5 different model homes on 5 adjacent lots on one side of a street. If 1 house is to be built on each lot, how many different arrangements of the 5 houses are possible?
 - * A. 120
 - B. 60
 - C. 25
 - D. 10
 - E. 5

(NAEP)

M11.E Data Analysis and Probability

Reporting Category

ASSESSMENT ANCHOR**M11.E.4 Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays.****ELIGIBLE CONTENT****M11.E.4.1** Make predictions using data displays and probability.*Reference: 2.7.8.E, 2.6.11.D***M11.E.4.1.1** Estimate or calculate to make predictions based on a circle, line, bar graph or given situation.**M11.E.4.1.2** Use probability to predict outcomes.

EXAMPLE ITEMS

- From a shipment of 500 batteries, a sample of 25 was selected at random and tested. If 2 batteries in the sample were found to be dead, how many dead batteries would be expected in the entire shipment?
 - A. 10
 - B. 20
 - C. 30
 - * D. 40
 - E. 50

(NAEP)

M11.E Data Analysis and Probability

Reporting Category

ASSESSMENT ANCHOR

M11.E.4 Develop and evaluate inferences and predictions or draw conclusions based on data or data displays.

ELIGIBLE CONTENT

M11.E.4.2 Analyze and/or interpret data on a scatter plot and/or use a scatter plot to make predictions.

Reference: 2.6.11.C, 2.6.11.D

M11.E.4.2.1 Draw, find and/or write an equation for a line of best fit for a scatter plot.

M11.E.4.2.2 Make predictions using the equations or graphs of best-fit lines of scatter plots.

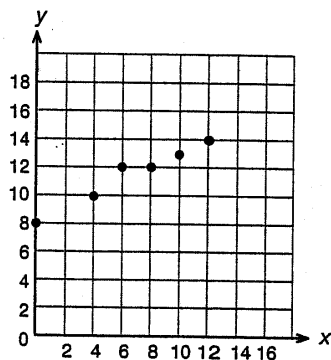
EXAMPLE ITEMS

- The annual maintenance cost of an appliance is given by the regression equation $y = 12.5x + 19.2$, where y represents the total maintenance cost and x represents the age of the appliance in years. Rounded to the nearest dollar, what is the expected maintenance cost of a 14-year-old appliance?

- A. \$ 33
- B. \$156
- *C. \$194
- D. \$281

(Pennsylvania Department of Education)

- Which of the given equations most closely represents the line of best fit for the scatter plot given below?



- A. $y = 2x + 8$
- *B. $y = \frac{1}{2}x + 8$
- C. $y = -\frac{1}{2}x + 8$
- D. $y = -2x + 8$

(Pennsylvania Department of Education)