Math Grade 6
Assessment Anchors
and Eligible Content

Pennsylvania Department of Education

www.pde.state.pa.us

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M6.A Numbers and Operations | Reporting Category

ASSESSMENT ANCHOR

M6.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers, and number systems.

ELIGIBLE CONTENT

M6.A.1.1 Express numbers in equivalent forms.

M6.A.1.1.1 Represent common percents as fractions and/or decimals (e.g., 25% = ¼ = .25) – common percents are 1%, 10%, 25%, 50%, 75%, 100%.

M6.A.1.1.2 Convert between fractions and decimals and/or differentiate between a terminating decimal and a repeating decimal.

M6.A.1.1.3 Represent a number in exponential form (e.g., $10 \times 10 \times 10 = 10^3$).

M6.A.1.1.4 Represent a mixed number as an improper fraction.

EXAMPLE ITEMS

Reference:

2.1.6.B Represent whole numbers, fractions, mixed numbers, decimals, and percents in **equivalent** forms.

2.1.6.C Use **models** to represent the concept of **equivalent** forms of a fraction, decimal, and/or percent.

M6.A Numbers and Operations Reporting Category

ASSESSMENT ANCHOR

M6.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers, and number systems.

	ELIGIBLE CONTENT
M6.A.1.2 Compare quantities and/or magnitudes of numbers.	**M6.A.1.2.1** Compare and/or order whole numbers, mixed numbers, fractions and/or decimals (do not mix fractions and decimals – decimals through thousandths).

EXAMPLE ITEMS

- Which number is **more** than $\frac{1}{3}$?

  * A. $\frac{1}{2}$

  B. $\frac{1}{4}$

  C. $\frac{1}{6}$

  D. $\frac{1}{8}$

  (New York State Department of Education)

- Which fractions are in order from **greatest to least**?

  * A. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$

  B. $\frac{1}{2}, \frac{4}{4}, \frac{3}{6}$

  C. $\frac{1}{6}, \frac{1}{3}, \frac{1}{2}$

  D. $\frac{2}{3}, \frac{3}{4}, \frac{2}{5}$

  (Pennsylvania Department of Education)

Reference:

2.1.6.A Model and compare values of whole numbers, mixed numbers, fractions, and decimals.

2.1.6.D Apply place value concepts to order and compare decimals; use the number line to order and compare decimals, fractions, and mixed numbers.

2.11.6.A Make comparisons of numbers (e.g., more, less, same, least, most, greater than, less than).

M6.A Numbers and Operations

ASSESSMENT ANCHOR

M6.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers, and number systems.

	ELIGIBLE CONTENT
M6.A.1.3 Apply number theory concepts (i.e., factors, multiples).	**M6.A.1.3.1** Find the Greatest Common Factor (GCF) of two numbers (through 50) and/or use the GCF to simplify fractions.
	M6.A.1.3.2 Find the Least Common Multiple (LCM) of two numbers (through 50) and/or use the LCM to find the common denominator of two fractions.
	M6.A.1.3.3 Use divisibility rules for 2, 3, 5 and/or 10 to draw conclusions and/or solve problems.

EXAMPLE ITEMS

- Six students bought exactly enough pens to share equally among themselves. Which of the following could be the number of pens they bought?

    A. 46
    * B. 48
    C. 50
    D. 52

(NAEP)

Reference:

2.1.6.E Apply number theory concepts to calculate the GCF (Greatest Common Factor) and/or LCM (Least Common Multiple) of two numbers.

M6.A Numbers and Operations | **Reporting Category**

ASSESSMENT ANCHOR

M6.A.1 Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems.
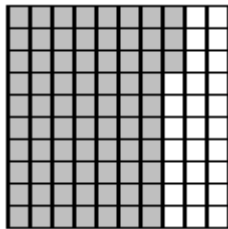
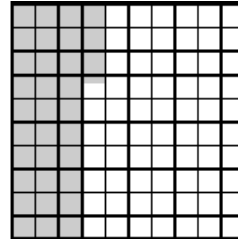|	**ELIGIBLE CONTENT**
M6.A.1.4 Use or develop models to represent percents.	**M6.A.1.4.1** Model percents (through 100%) using drawings, graphs and/or sets (e.g., circle graph, base ten blocks, etc)

EXAMPLE ITEMS

Which percent names the amount of the grid that is shaded?
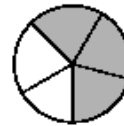
    A. 6.3%
    B. 7.3%
    C. 63%
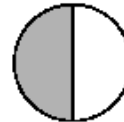 * D. 73%

(Connecticut State Department of Education)

The shaded area shown above represents a fractional part of the whole decimal square. A class is representing decimal squares with circle graphs. Which of the circles below has a shaded portion that is equivalent?
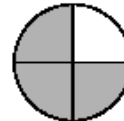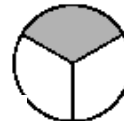

A.

B.

C.

* D.

(New Hampshire Department of Education)

Reference:

2.1.6.C Use **models** to represent the concept of **equivalent** forms of a fraction, decimal, and/or percent.

M6.A Numbers and Operations Reporting Category

ASSESSMENT ANCHOR

M6.A.2 Understand the meanings of operations, use operations and understand how they relate to each other.

ELIGIBLE CONTENT

M6.A.2.1 Select and/or use operations to simplify or solve problems.

M6.A.2.1.1 Complete equations by using the following properties: associative, commutative, distributive and identity.

EXAMPLE ITEMS

- Look at the expression below.
  $12 + 4 \times (12 - 9)$

  What is the value of the expression?

  * A. 24
  B. 48
  C. 51
  D. 55

(Maryland State Department of Education)

Reference:

2.1.6.F Apply the **associative, commutative, distributive** and/or **identity** properties to write **equivalent** forms of **expressions**.

2.2.6.C Apply the associative, commutative, distributive, and/or identity properties to evaluate numerical **expressions**.

M6.A Numbers and Operations | **Reporting Category**

ASSESSMENT ANCHOR

M6.A.3 Compute accurately and fluently and make reasonable estimates.

	ELIGIBLE CONTENT
M6.A.3.1 Apply estimation strategies to a variety of problems.	**M6.A.3.1.1** Use estimation to solve problems involving whole numbers and decimals (up to 2-digit divisors and 4 operations).

EXAMPLE ITEMS

- An average of 5,000 people enter a certain shopping mall each day. If the shopping mall is open every day of the year, which of the following would be a reasonable estimate of how many people enter the shopping mall each year?

      A. 1,500,000 people
      ★ B. 2,000,000 people
      C.   200, 000 people
      D. 9,000,000 people

  (Pennsylvania Department of Education)

- Sound travels at approximately 330 meters per second. The sound of an explosion took 28 seconds to reach a person. Which of these is the closest estimate of how far away the person was from the explosion?

      A. 12,000 meters
      ★ B. 9,000 meters
      C. 8,000 meters
      D. 6,000 meters

  (TIMSS)

Reference:

2.2.6.D Estimate solutions of problems involving whole numbers and decimals and check the **reasonableness** of those estimates.

M6.A Numbers and Operations | Reporting Category

ASSESSMENT ANCHOR

M6.A.3 Compute accurately and fluently and make reasonable estimates.

	ELIGIBLE CONTENT
M6.A.3.2 Solve problems with and without the use of a calculator.	**M6.A.3.2.1** Solve problems involving operations (+, -, x, ÷) with whole numbers, decimals (through thousandths) and fractions (avoid complicated LCDs) - straight computation or word problems.

EXAMPLE ITEMS

- Georgia is making two cakes using two different recipes.

  One recipe uses $1\frac{1}{3}$ cups of flour and the other recipe uses

  $1\frac{3}{4}$ cups of flour. What is the total amount of flour, in cups,

  needed for both recipes?

  A. $2\frac{1}{12}$ cups

  B. $2\frac{4}{7}$ cups

  ★ C. $3\frac{1}{12}$ cups

  D. $3\frac{3}{7}$ cups

  (Maryland State Department of Education)

- Use the picture below to answer the question.

  Valerie wants to make cookies for her class bake sale.

  She found a recipe that calls for $\frac{2}{3}$ cup of flour for each batch of cookies.

  How many batches can she make using 6 cups of flour?

  A. 12

  ★ B. 9

  C. 6

  D. 4

  (New Hampshire Department of Education)

Reference:

2.2.6.B   Add, subtract, multiply, and divide whole numbers, decimals, fractions, and mixed numbers.

M6.B Measurement   Reporting Category

ASSESSMENT ANCHOR

M6.B.1 Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.

	ELIGIBLE CONTENT
M6.B.1.1 Compare and/or determine elapsed time.	**M6.B.1.1.1** Determine and/or compare elapsed time to the minute (time may cross AM to PM or more than one day).

EXAMPLE ITEMS

- A school group wants to visit the Museum of New Hampshire History in Concord. They plan to spend two hours and thirty minutes for the visit and lunch. In addition, it takes thirty minutes to travel to the museum each way. If they leave school at 11:15 A.M., at what time will the students return to school?

  A. 2:30 P.M.
  * B. 2:45 P.M.
  C. 3:00 P.M.
  D. 3:15 P.M.

  (New Hampshire Department of Education)

- There was a power failure last weekend. The power went off on Friday at 7:00 P.M. and came back on at 2:00 P.M. Sunday. For how many hours was the power off?

  * A. 43 hours
  B. 19 hours
  C. 26 hours
  D. 38 hours

  (Pennsylvania Department of Education)

Reference:

2.3.6.C   Use given measurements to calculate a missing length, perimeter, area, and/or **volume**; Calculate elapsed time across am/pm and across days.

2.3.6.D   Perform basic conversions within the **metric** and within the **customary systems**.

M6.B Measurement   Reporting Category

ASSESSMENT ANCHOR

M6.B.2 Apply appropriate techniques, tools and formulas to determine measurements.

	ELIGIBLE CONTENT
M6.B.2.1 Choose or use appropriate tools and/or units to determine measurements within the same system.	**M6.B.2.1.1** Use or read a ruler to measure to the nearest 1/16 inch or millimeter.
	M6.B.2.1.2 Choose the more precise measurement of a given object (e.g., smaller measurements are more precise).
	M6.B.2.1.3 Measure angles using a protractor up to 180° - protractor must be drawn - one side of the angle to be measured should line up with the straight edge of the protractor.

EXAMPLE ITEMS

Reference:

2.3.6.B   Use appropriate units to measure perimeter, area, and **volume**; use a protractor to measure angles between 0 and 180 degrees.

M6.B Measurement

ASSESSMENT ANCHOR

M6.B.2 Apply appropriate techniques, tools and formulas to determine measurements.

ELIGIBLE CONTENT

M6.B.2.2 Solve problems involving length, perimeter, area and/or volume of geometric figures.

M6.B.2.2.1 Find the perimeter of any polygon (may include regular polygons where only the measure of one side is given – same units throughout).

EXAMPLE ITEMS

Reference:

2.3.6.A Use **models** to illustrate the meaning of perimeter, area, and **volume**.

2.3.6.C Use given measurements to calculate a missing length, perimeter, area, and/or **volume**; Calculate elapsed time across am/pm and across days.

M6.B Measurement   **Reporting Category**

ASSESSMENT ANCHOR

M6.B.2 Apply appropriate techniques, tools and formulas to determine measurements.

ELIGIBLE CONTENT

M6.B.2.3 Identify, label, and/or list properties of angles or triangles.

M6.B.2.3.1 Define, label and/or identify right, straight, acute and obtuse angles.

EXAMPLE ITEMS

Reference:

2.9.6.A   Identify, define, label, and/or describe properties of 1-, 2-, and 3-dimensional shapes and their related parts, and classify and compare 2- and 3- dimensional shapes on the basis of their properties.

M6.C Geometry   Reporting Category

ASSESSMENT ANCHOR

M6.C.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.

|	**ELIGIBLE CONTENT**
M6.C.1.1 Define and/or use basic properties of triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons, nonagons, decagons and circles.	**M6.C.1.1.1** Identify, classify and/or compare polygons (up to ten sides.)
	M6.C.1.1.2 Identify and/or describe properties of all types of triangles (scalene, equilateral, isosceles, right, acute, obtuse).
	M6.C.1.1.3 Identify and/or determine the measure of the diameter and/or radius of a circle (when one or the other is given).
	M6.C.1.1.4 Identify and/or use the total number of degrees in a triangle, quadrilateral and/or circle.

EXAMPLE ITEMS

- Look at triangle XYZ shown below.
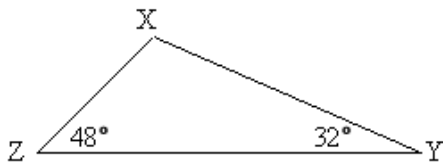
Note: The figure is not drawn to scale.

What is the measure, in degrees, of $\angle ZXY$?

    A. 20°

    B. 80°

  * C. 100°

    D. 120°

(Maryland State Department of Education)

- What is the **hypotenuse** in right triangle ABC?
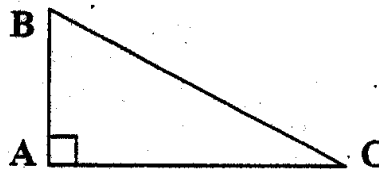
    A. angle A
    B. angle C
    C. side AB
 * D. side BC

- A triangle that has sides with lengths 6, 6, and 10 is called

    A. acute
    B. right
    C. scalene
 * D. isosceles
    E. equilateral

(NAEP)

M6.C Geometry   Reporting Category

ASSESSMENT ANCHOR

M6.C.1 Analyze characteristics and properties of two- and three- dimensional geometric shapes and demonstrate understanding of geometric relationships.

|	**ELIGIBLE CONTENT**
M6.C.1.2 Represent and/or use concepts and relationships of lines and line segments.	**M6.C.1.2.1** Identify, describe and/or label parallel, perpendicular or intersecting lines.
	M6.C.1.2.2 Identify, draw and/or label points, planes, lines, line segments, rays, angles and vertices.

EXAMPLE ITEMS

- The figure below is a rectangular prism. Which of the following edges is perpendicular to face *BFGC*?
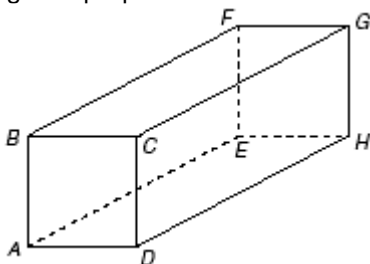
- * A. $\overline{AB}$
- B. $\overline{AE}$
- C. $\overline{DH}$
- D. $\overline{BF}$

(New Jersey Department of Education)

Reference:

2.9.6.A Identify, define, label, and/or describe properties of 1-, 2-, and 3-dimensional shapes and their related parts, and classify and compare 2- and 3- dimensional shapes on the basis of their properties.

2.3.6.C Use given measurements to calculate a missing length, perimeter, area, and/or **volume**; Calculate elapsed time across am/pm and across days.

M6.C Geometry   **Reporting Category**

ASSESSMENT ANCHOR

M6.C.2 Identify and/or apply concepts of transformations or symmetry.

ELIGIBLE CONTENT

Not assessed at Grade 6.

EXAMPLE ITEMS

M6.C Geometry   Reporting Category

ASSESSMENT ANCHOR

M6.C.3 Locate points or describe relationships using the coordinate plane.
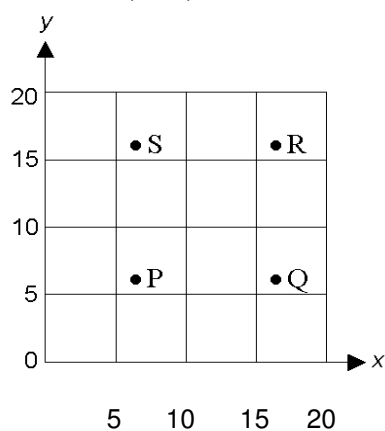
	ELIGIBLE CONTENT
M6.C.3.1 Identify, plot or match points given an ordered pair.	**M6.C.3.1.1** Plot, locate or identify points in Quadrant I and/or on the x and y axes with intervals of 1, 2, 5 or 10 units - up to a 200 by 200 grid. Points may be in-between lines.

EXAMPLE ITEMS

- Which point on the graph could have coordinates (7,16)?

A. Point P
B. Point Q
C. Point R
D. Point S

*

(TIMSS)

Reference:

2.9.6.C Identify on a 2-dimensional **coordinate system** the location of points with non-negative fractional or decimal coordinates; plot in a two-dimensional **coordinate system** a point represented by an ordered pair of non-negative fractions, mixed numbers, or decimals.

M6.E Data Analysis and Probability   **Reporting Category**

ASSESSMENT ANCHOR
M6.D.1 Demonstrate an understanding of patterns, relations and functions.

	ELIGIBLE CONTENT
M6.D.1.1 Create or extend patterns.	**M6.D.1.1.1** Create, extend or find a missing element in a pattern displayed in a table, chart or graph (pattern must show at least 3 repetitions - may use up to 2 operations with whole numbers).

EXAMPLE ITEMS

- Use the number line below to answer the question.
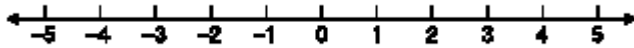
What are the next two numbers in the pattern below?

$$-4, -1, -2, 1, 0, 3$$

* A. 2, 5
  B. 4, 1
  C. 0, 1
  D. 6, 5

(New Hampshire Department of Education)

- Use the table below to answer the question.

x	y
0	6
1	8
2	10

Which sentence is true for all of the pairs in the table?

A. $y = x + 6$

B. $y = x + 7$

C. $y = 4x + 2$

* D. $y = 2x + 6$

(New Hampshire Department of Education)

Reference:

2.8.6.C   Recognize, describe, extend, create, replicate, form a rule, and/or find a missing element for a variety of whole number **patterns, sequences**, and relationships verbally, numerically, symbolically, and graphically.

ASSESSMENT ANCHOR
M6.D.1 Demonstrate an understanding of patterns, relations and functions.

ELIGIBLE CONTENT

M6.D.1.2 Analyze patterns.

M6.D.1.2.1 Determine a rule based on a pattern or illustrate a pattern based on a given rule (displayed on a table, chart or graph; pattern must show at least 3 repetitions).

EXAMPLE ITEMS

Reference:

2.8.6.C Recognize, describe, extend, create, replicate, form a rule, and/or find a missing element for a variety of whole number **patterns, sequences**, and relationships verbally, numerically, symbolically, and graphically.

2.8.6.D Determine a functional rule from a table or graph.

M6.E Data Analysis and Probability   Reporting Category

ASSESSMENT ANCHOR

M6.D.2 Represent and/or analyze mathematical situations and structures using algebraic symbols, words, tables, and graphs.

	ELIGIBLE CONTENT
M6.D.2.1 Select and/or use appropriate strategies to solve number sentences.	**M6.D.2.1.1** Identify the inverse operation needed to solve a one-step equation.
	M6.D.2.1.2 Solve a one-step equation (i.e., using the inverse operation -whole numbers only).

EXAMPLE ITEMS

- ☐ represents the number of magazines that Lina reads each week. Which of these represents the total number of magazines that Lina reads in 6 weeks?

    A. $6 + ☐$

  * B. $6 \times ☐$

    C. $☐ + 6$

    D. $(☐ + ☐) \times 6$

    (TIMSS)

- N stands for the number of stamps John had. He gave 12 stamps to his sister. Which expression tells how many stamps John has now?

    A. $N + 12$
  * B. $N - 12$
    C. $12 - N$
    D. $12 \times N$

    (NAEP)

Reference:

2.8.6.A   Use the concept of equality to demonstrate understanding of the **distributive** property.

2.8.6.B   Select and use strategies to solve number sentences (and **inequalities**) and explain the method of solution.

M6.E Data Analysis and Probability   Reporting Category

ASSESSMENT ANCHOR

M6.D.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.

	ELIGIBLE CONTENT
M6.D.2.2 Create and/or interpret expressions or equations that model problem situations.	**M6.D.2.2.1** Match an equation or expression involving one variable, to a verbal math situation (one operation only).

EXAMPLE ITEMS

Reference:

2.8.6.E   Use combinations of symbols and numbers to create **expressions, equations,** and **inequalities** that model mathematical situations.

2.8.6.F   Interpret the results of solving **equations** in one **variable** in the context of the situation that motivated the model.

M6.E Data Analysis and Probability   **Reporting Category**

ASSESSMENT ANCHOR

M6.D.3 Analyze change in various contexts.

ELIGIBLE CONTENT

Not assessed at Grade 6.

EXAMPLE ITEMS

M6.E Data Analysis and Probability   Reporting Category

ASSESSMENT ANCHOR

M6.D.4 Describe or use models to represent quantitative relationships.

ELIGIBLE CONTENT

Not assessed at Grade 6.

EXAMPLE ITEMS

M6.E Data Analysis and Probability | Reporting Category

ASSESSMENT ANCHOR

M6.E.1 Formulate questions that can be addressed with data and/or collect, organize, display, and analyze data.

M6.E.1.1 Interpret data shown in frequency tables, histograms, circle, bar or double bar graphs, line or double line graphs or line plots.

ELIGIBLE CONTENT

M6.E.1.1.1 Analyze data and/or answer questions pertaining to data represented in frequency tables, circle graphs, double bar graphs, double line graphs or line plots (for circle graphs, no computation with percents).

M6.E.1.1.2 Choose the appropriate representation for a specific set of data (choices should be the same type of graph).

M6.E.1.1.3 Display data in frequency tables, circle graphs, double-bar graphs, double line graphs or line plots using a title, appropriate scale, labels and a key when needed.
Circle graphs for open-ended items must show a center point and tic marks.

EXAMPLE ITEMS

- Pascal records the scores from a basketball team's last 24 games, as shown below.

74	69	69	68	83	68	74	69
81	78	64	62	68	61	77	71
78	68	77	69	62	61	76	69

He displays the scores in this frequency table. Pascal's frequency table contains an error.

Basketball Scores

Range of Scores	Frequency
60 – 64	4
65 – 69	9
70 – 74	3
75 – 79	5
80 – 84	2

Which statement best describes the error in Pascal's frequency table?
  A. The 75-79 range has too few scores.
  B. The 80-84 range has too many scores.
* C. The total frequency is too low.
  D. The total frequency is too high.

(Maryland State Department of Education)

Reference:
2.6.6.B Select an appropriate method to organize data; select an appropriate format to display data.
2.6.6.E Interpret data displayed in a table, **histogram,** graph, or data summarized by numerical measures.

- Fernando surveys the students at his school to find out their favorite type of music. The results are shown in the circle graph below.

Favorite Music of Students
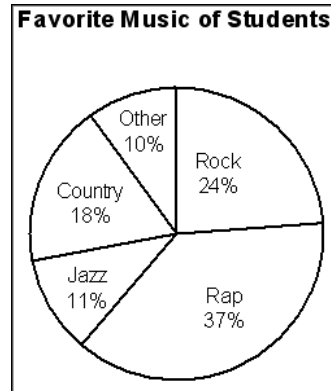
What is the percent of students who chose rap or country as their favorite type of music?
  A. 18%
  B. 19%
  C. 37%
* D. 55%

(Maryland State Department of Education)

2.7.6.B Organize data collected in a simulation and select an appropriate format to display the data.

M6.E Data Analysis and Probability   Reporting Category

ASSESSMENT ANCHOR

M6.E.2 Select and use appropriate statistical methods to analyze data.

	ELIGIBLE CONTENT
M6.E.2.1 Describe data sets using mean, median, mode and/or range.	**M6.E.2.1.1** Determine/calculate the mean, median, mode and/or range of displayed data (data can be displayed in a table or line plot – use whole numbers only up to 2 digits).

EXAMPLE ITEMS

- Anita drove 83.4, 98.1, 83.2 and 94 miles on four different days.
  What is the AVERAGE number of miles Anita drove on the four days?

  Answer: 89.675

  (Connecticut State Department of Education)

Reference:

2.6.6.C   Select and use, as appropriate, the **mean**, **median**, **mode,** and/or **range** to describe sets of data.

2.6.6.D   Use measures of **central tendency** to compare two sets of data.

M6.E Data Analysis and Probability   Reporting Category

ASSESSMENT ANCHOR

M6.E.3 Understand and apply basic concepts of probability.

	ELIGIBLE CONTENT
M6.E.3.1 Determine all possible combinations, outcomes and/or calculate the probability of a simple event.	**M6.E.3.1.1** Define and/or find the probability of a simple event (express as a fraction in lowest terms).
	M6.E.3.1.2 Determine/show all possible combinations involving no more than 20 total arrangements (e.g., tree diagram, table, grid).

EXAMPLE ITEMS

- Kathy tosses a penny 24 times. The penny lands either with the head side showing or the tail side showing. The data below shows the how the penny lands each time.

Heads	Tails	Heads	Tails
Tails	Tails	Heads	Tails
Tails	Tails	Tails	Tails
Heads	Heads	Tails	Heads
Tails	Tails	Tails	Tails
Tails	Tails	Tails	Tails

   Kathy tosses the penny 100 more times. Based on the data, what is the percent of times that the penny will land on heads?

   A. 18%
   * B. 25%
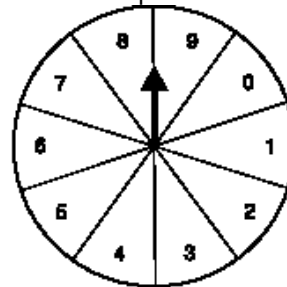   C. 42%
   D. 75%

   (Maryland State Department of Education)

- A bag contains 2 green cubes, 3 blue cubes, and 5 red cubes. Nick places his hand in the bag and picks a cube without looking. What is the probability that he picks either a blue or a red cube?

   A. $\frac{1}{5}$

   B. $\frac{1}{2}$

   C. $\frac{2}{3}$

   * D. $\frac{4}{5}$

   (Colorado Department of Education)

- Use the picture of the spinner below to answer the question.

   What is the probability that the arrow will land on a prime number?

   A. $\frac{3}{10}$

   * B. $\frac{4}{10}$

   C. $\frac{5}{10}$

   D. $\frac{6}{10}$

   (New Hampshire Department of Education)

Reference:

2.7.6.C Express the **probability** of a simple event as a fraction, decimal, and percent.

2.7.6.D List the possible outcomes for two **independent events** and compare the outcomes.

2.7.6.E Find and interpret the experimental **probability** of an outcome of a simple event.

M6.E Data Analysis and Probability   Reporting Category

ASSESSMENT ANCHOR

M6.E.4 Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays.

ELIGIBLE CONTENT

Not assessed at Grade 6.

EXAMPLE ITEMS