A Message from the Authors:

Thank you for downloading this *Math Momentum* product! We have regrouped exercises from our popular math warm-ups to produce this snapshot of students' proficiency on one specific topic!! This PDF document also provides detailed solutions to each question. Our Snapshot product line continues to expand with each Snapshot focusing on a single, critical math concept with 10 problems per set.

These multiple choice problems can be used to quickly assess students' math skills and understanding of specific concepts, providing you with the information needed to address areas of weakness and to reteach or reinforce essential skills. These exercises can also be used to diagnose possible reasons for a student's lack of progress in mathematics by exposing missing skills, fundamental math errors, or a lack of proficiency with the basics.

Key features of each problem set:

- Each product focuses on one fundamental math concept critical to students' math understanding.
- Multiple choice answers are provided for each exercise based on the design of numerous standardized tests.
- Detailed step-by-step solutions are available for every question (written specifically for students to develop or reinforce their understanding of basic mathematical and algebraic processes and to expose and correct students' errors).
- Modifications can be made to meet teacher's and students' needs using TPT's EASEL features.
- Common Core State Standards for Mathematics as well as most appropriate Mathematical Practice are noted for each problem (although more than one practice often applies).
- Formulas used within these problems are common formulas found on standardized tests, but can also be found on our Formula Sheet.
- Check out our full line of Snapshot Products!

We hope that you find our Snapshots beneficial and we look forward to your comments! We value your input! We encourage you to use these math problems to uncover your students' areas of strength or weakness & build math proficiency in your classroom! Follow us on TPT and on Facebook or visit us at mathmomentum.com to check out our extensive selection of products and all of our free resources!

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Common Core Standard: 6.EE.1, 8.EE.1
Mathematical Practice: *Attend to precision.*

1. Simplify: 3^5

A 8
B 15
C 125
D 243

Common Core Standard: 6.EE.2.c, A-APR.1
Mathematical Practice: *Reason abstractly and quantitatively.*

2. Simplify: $x^4 \cdot x^5$

A x^9
B x^{20}
C $2x^9$
D $2x^{20}$

Common Core Standard: 6.EE.2.c, A-APR.1
Mathematical Practice: *Reason abstractly and quantitatively.*

3. Simplify: $4(y^3)^2$

A $4y^5$
B $16y^5$
C $4y^6$
D $16y^6$

Common Core Standard: 6.EE.2.c, A-APR.6
Mathematical Practice: *Reason abstractly and quantitatively.*

4. Simplify: $\frac{z^8}{z^2}$

A z^{10}
B z^6
C z^4
D 1^4

Common Core Standard: 6.EE.1, 8.EE.1
Mathematical Practice: *Attend to precision.*

5. Simplify: -2^4

A −16
B −8
C 8
D 16

Common Core Standard: 6.EE.2.c, 8.EE.1, A-APR.1
Mathematical Practice: *Reason abstractly and quantitatively.*

6. Simplify: $5x^2 \cdot 3x^4 \cdot 2x$

A $10x^6$ B $10x^8$ C $30x^7$ D $30x^9$

Common Core Standard: 6.EE.2.c, 8.EE.1, A-APR.1
Mathematical Practice: *Reason abstractly and quantitatively.*

7. Simplify: $(-4x^3)^2$

A $-4x^5$ B $8x^5$ C $-16x^5$ D $16x^6$

Common Core Standard: 6.EE.2.c, 8.EE.1, A-APR.6
Mathematical Practice: *Reason abstractly and quantitatively.*

8. Simplify: $\frac{8x^6y^2}{2x^2y^2}$

A $4x^4$ B $6x^4$ C $4x^3y$ D $6x^3y$

Common Core Standard: 6.EE.2.c, 8.EE.1, A-APR.1
Mathematical Practice: *Reason abstractly and quantitatively.*

9. Simplify: $(x^2)^3 \cdot 2x^4 \cdot (3x)^2$

A $5x^{11}$ B $6x^{11}$ C $18x^{12}$ D $12x^{48}$

Common Core Standard: 6.EE.1, 8.EE.1
Mathematical Practice: *Attend to precision.*

10. Simplify using properties of exponents: $\frac{4^3 \cdot 8^2}{16}$

A 4^3 B 2^5 C 2^6 D 2^8

1. In the expression 3^5, note that 3 is the base and 5 is the exponent. The exponent indicates the number of times the base is used as a factor. In this case, multiply the base (3) five times to find the value of 3^5 as shown below:

$$\begin{aligned} 3^5 &= \underbrace{(3)\,(3)}\,\underbrace{(3)\,(3)}\,(3) \\ &= \underbrace{9 \cdot 9} \cdot 3 \\ &= 81 \cdot 3 \\ &= 243 \end{aligned}$$

[An exponent indicates how many times the base is used as a factor.]

Additional note: It is important to distinguish the base from a coefficient as shown in the diagram. The coefficient is not raised to that power.

$$\overset{\text{coefficient}}{2}\,\overset{\text{base}}{x}^{\overset{\text{exponent}}{5}}$$

2. The numbers 4 and 5 are exponents which indicate how many times the base (in this case, x) is used as a factor. It is possible to expand the expression using this definition as shown below:

Expand x^4 and x^5: $$= \overbrace{x \cdot x \cdot x \cdot x}^{x^4} \cdot \overbrace{x \cdot x \cdot x \cdot x \cdot x}^{x^5}$$

[An exponent indicates how many times the base is used as a factor.]

Write in exponential form: $= x^9$

Note that adding the exponents 4 and 5 produces the exponent 9. Through continued examples, it would be possible to develop this property of exponents, simply stated: If the bases are the same when multiplying, add the exponents.

$$x^4 \cdot x^5 = x^{4+5} = x^9$$

[If the bases are the same when multiplying, add the exponents.]

3. In this case, 4 is the coefficient (number in front of the variable) and is not raised to that power. The exponent 2 indicates the number of times that the base y^3 is used as a factor. It is again possible to expand this expression using that information as shown below:

$$4(y^3)^2$$

Expand $(y^3)^2$: $= 4 \cdot (y^3) \cdot (y^3)$

(An exponent indicates how many times the base is used as a factor.)

Expand y^3: $= 4 \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$

Write in exponential form: $= 4y^6$

Note that multiplying the exponents 3 and 2 produces the exponent 6. Through continued examples, it would be possible to develop this property of exponents, simply stated: When raising a power to a power, multiply the exponents.

$$4(y^3)^2 = 4 \cdot y^{3 \cdot 2} = 4y^6$$

(When raising a power to a power, multiply the exponents.)

4. Expand this expression using the definition of an exponent as shown below:

$$\frac{z^8}{z^2}$$

Expand z^8 and z^2: $= \dfrac{z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z}{z \cdot z}$

(An exponent indicates how many times the base is used as a factor.)

Simplify: $= \dfrac{z \cdot z \cdot z \cdot z \cdot \cancel{z} \cdot \cancel{z} \cdot z \cdot z}{\cancel{z} \cdot \cancel{z}}$

(Any number or in this case, variable, divided by itself equals 1.)

Write in exponential form: $= z^6$

Note that subtracting the exponents 8 and 2 produces the exponent 6. Through continued examples, it would be possible to derive the following property of exponents, simply stated: If the bases are the same when dividing, subtract the exponents.

$$\frac{z^8}{z^2} = z^{8-2} = z^6$$

(If the bases are the same when dividing, subtract the exponents.)

5. Again, the number 4 is an exponent which indicates how many times the base is used as a factor. In this case, the base is 2; the negative sign is not raised to the 4th power. (−1 is the coefficient of 2^4)

$$-2^4 = -(2)(2)(2)(2) = -16$$

Note: To raise −2 to the 4th power, parentheses must be used: $(-2)^4 = 16$.

6. It is not necessary to memorize properties of exponents which can easily be derived by rewriting in expanded form when and if required. Both methods are shown below to simplify the expression.

$$5x^2 \cdot 3x^4 \cdot 2x$$

Multiply the coefficients: $= 30x^2 \cdot x^4 \cdot x$

Rewrite in expanded form if necessary: $= 30(x)(x) \cdot (x)(x)(x)(x) \cdot (x)$

OR add the exponents: $= 30x^{(2+4+1)}$

Simplify: $= 30x^7$

An exponent indicates how many times the base is used as a factor.

If the bases are the same when multiplying, add the exponents.

7. In the expression $(-4x^3)^2$, note that the exponent 2 outside the parentheses means that the entire expression $-4x^3$ is raised to the 2nd power. In other words, 2 is the exponent and $-4x^3$ is the base. Simplify the expression as follows:

$$(-4x^3)^2$$

Rewrite in expanded form if necessary: $= (-4x^3)(-4x^3)$

$= (-4 \cdot x \cdot x \cdot x)(-4 \cdot x \cdot x \cdot x)$

OR multiply the exponents: $= (-4)^2 x^{3 \cdot 2}$

Simplify: $= 16x^6$

An exponent indicates how many times the base is used as a factor.

When raising a power to a power, multiply the exponents.

8. Again, it is not necessary to memorize properties of exponents which can easily be derived by rewriting in expanded form. Both methods are shown below. Simplify the expression as follows:

$$\frac{8x^6y^2}{2x^2y^2}$$

Divide the coefficients: $= \frac{4x^6y^2}{x^2y^2}$

Rewrite in expanded form if necessary: $= \frac{4(x)(x)(x)(x)(x)(x)(y)(y)}{(x)(x)(y)(y)}$

An exponent indicates how many times the base is used as a factor.

Simplify: $= \frac{4(x)(x)(x)(x)(\cancel{x})(\cancel{x})(\cancel{y})(\cancel{y})}{(\cancel{x})(\cancel{x})(\cancel{y})(\cancel{y})}$

Any number or in this case, variable, divided by itself equals 1.

OR subtract the exponents: $= 4x^{6-2}y^{2-2}$

If the bases are the same when dividing, subtract the exponents.

Simplify: $= 4x^4y^0 = 4x^4$

Any non-zero base raised to the power of zero is equal to 1.

9. To simplify this expression, follow the order of operations (parentheses, exponents, multiplication/division, addition/subtraction). Because there is no simplifying to do within the parentheses, begin by simplifying the expressions with exponents before multiplying as follows:

$$(x^2)^3 \cdot 2x^4 \cdot (3x)^2$$

Simplify $(x^2)^3$: $= x^6 \cdot 2x^4 \cdot (3x)^2$

(When raising a power to a power, multiply the exponents.)

Simplify $(3x)^2$: $= x^6 \cdot 2x^4 \cdot 9x^2$

(An exponent indicates how many times the base is used as a factor.)

Multiply coefficients: $= 18x^6 \cdot x^4 \cdot x^2$

Simplify $x^6 \cdot x^4 \cdot x^2$: $= 18x^{12}$

(If the bases are the same when multiplying, add the exponents.)

Of course, it is always possible (although perhaps tedious) to simplify by expanding the expression using the definition of an exponent as shown below:

$$(x^2)^3 \cdot 2x^4 \cdot (3x)^2$$

Expand $(x^2)^3$ and $(3x)^2$: $= (x^2)(x^2)(x^2) \cdot 2x^4 \cdot (3x)(3x)$

Expand x^2 and x^4: $= (x \cdot x)(x \cdot x)\,(x \cdot x) \cdot 2 \cdot x \cdot x \cdot x \cdot x \cdot (3x)(3x)$

Write in exponential form: $= 2 \cdot 3 \cdot 3 \cdot x^{12}$

Multiply coefficients: $= 18x^{12}$

10. Note that the answer choices are given in exponential form (a base raised to a power). To determine which choice is correct, change each term to the same base in order to combine the exponents. Note that 4, 8 and 16 could be rewritten as powers of 2. The process is shown below:

$$\frac{4^3 \cdot 8^2}{16}$$

$4 = (2)(2) = 2^2$
$8 = (2)(2)(2) = 2^3$
$16 = (2)(2)(2)(2) = 2^4$

Rewrite as powers of 2: $$= \frac{(2^2)^3\,(2^3)^2}{2^4}$$

When raising a power to a power, multiply the exponents.

Simplify $(2^2)^3$ and $(2^3)^2$ $$= \frac{2^6 \cdot 2^6}{2^4}$$

If the bases are the same when multiplying, add the exponents.

Simplify $2^6 \cdot 2^6$: $$= \frac{2^{12}}{2^4}$$

If the bases are the same when dividing, subtract the exponents.

Simplify $\frac{2^{12}}{2^4}$: $$= 2^8$$

Again, it is always possible (although tedious) to simplify by expanding the expression using the definition of an exponent as shown below:

$$\frac{4^3 \cdot 8^2}{16} = \frac{4\cdot4\cdot4\cdot8\cdot8}{16} = \frac{4\cdot\cancel{4}\cdot\cancel{4}\cdot8\cdot8}{\cancel{16}} = 4\cdot8\cdot8 = \underbrace{\overbrace{2\cdot2}^{4}\cdot\overbrace{2\cdot2\cdot2}^{8}\cdot\overbrace{2\cdot2\cdot2}^{8}}_{} = 2^8$$

Because the answer choices are shown as powers of 2, rewrite in exponential form with 2 as the base rather than multiply the numbers.