MATH Items for Practice

Grade 11

Student Name: ________________________________

School Name: ________________________________
ACKNOWLEDGEMENT

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1. Look at this expression.

\[ k(mk - k^2) \]

What is the value of this expression when \( k = -1 \) and \( m = 2 \)?

A. \(-2\)
B. 0
C. 1
D. 3

2. A rectangle is divided in half by a dotted line, as shown in this diagram.

![Diagram of a rectangle divided in half](image)

Each half is similar to the original rectangle. The length of the original rectangle is 1 meter. What is the width, \( w \), in meters, of the original rectangle?

A. \( \frac{1}{4} \)
B. \( \frac{1}{2} \)
C. \( \sqrt{\frac{1}{2}} \)
D. \( \sqrt{2} \)
3. Look at this pattern.

Step 1

Step 2

Step 3

Step 4

If the pattern continues, how many will be in Step 50?
A. 100
B. 102
C. 2500
D. 2502

4. Look at the shaded-gray figure in square $PQRS$.

The figure is formed by drawing a line segment and a quarter-circle.
- The line segment connects point $S$ to point $Q$.
- The quarter-circle has a radius of 6.0 centimeters and has its center at point $P$.

What is the area, in square centimeters, of the shaded-gray figure?
A. $9\pi - 18$
B. $\frac{9\pi}{2}$
C. $9\pi$
D. $36\pi - 18$
5. Look at parallelogram $EFGH$

The diagonals of parallelogram $EFGH$ intersect at point $P$. What are the coordinates of point $P$?
6. Triangle $KLM$ is similar to triangle $GHJ$ ($\triangle KLM \sim \triangle GHJ$).

The perimeter of triangle $KLM$ is 16 centimeters. The perimeter of triangle $GHJ$ is 40 centimeters.

a. What is the ratio of side $ML$ to side $JH$?

b. What is the ratio of the area of triangle $KLM$ to the area of triangle $GHJ$?
7. What are the coordinates of the image of point \( P(1, 4) \) after a clockwise rotation of \( 90^\circ \) about the origin?

A. \((4, -1)\)
B. \((4, 1)\)
C. \((1, -4)\)
D. \((-1, -4)\)

8. Ariel used tiles to make this rectangle.

Which equation is modeled by Ariel’s rectangle?

A. \( x(5x + 6) = 5x^2 + 6x \)
B. \((x + 3)^2 = x^2 + 6x + 9\)
C. \((x + 2) + (x + 3) = 2x + 5\)
D. \((x + 2)(x + 3) = x^2 + 5x + 6\)
9. Andy recorded the number of points he scored in each basketball game he played last season. He used the data to make this box-and-whisker plot.

Based on the box-and-whisker plot, which statement must be true?
A. Andy’s mean score per game was 22 points.
B. Andy scored more than 25 points in only 1 game.
C. In the games he played, Andy’s scores had a range of 5 points.
D. In at least half the games he played, Andy scored from 20 points to 25 points.

10. Emma pedals her bicycle at a constant rate. Which graph could show how one pedal’s height above the ground changes with time?
11. A rectangle has a length of 5 feet and a width of 3 feet. When the length and width are each increased by the same amount, the perimeter is increased by 10 feet. By how much are the length and width increased?

12. Every 15 minutes on Thursday, Aisha counted the number of bank customers waiting in line. She made this bar graph from all of her observations.

   a. What was the median number of customers waiting in line on Thursday?

   b. What was the mean number of customers waiting in line on Thursday?
13. A college recruiter compared the starting salaries for graduates with various majors. This table shows the results for two majors.

<table>
<thead>
<tr>
<th>Major</th>
<th>Mean Starting Salary</th>
<th>Median Starting Salary</th>
<th>Range of Starting Salaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>$39,000</td>
<td>$30,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Engineering</td>
<td>$35,000</td>
<td>$34,000</td>
<td>$12,000</td>
</tr>
</tbody>
</table>

Derrick will choose a major. He will decide between a business major and an engineering major. Use all of the information in the table to explain which major Derrick should choose.
14. Parallel lines $r$ and $s$ are cut by transversal $t$, as shown in the diagram below.

Which of the following must be true?

A. $m\angle 1 + m\angle 5 = 180^\circ$
B. $m\angle 2 + m\angle 8 = 180^\circ$
C. $m\angle 1 = m\angle 7$
D. $m\angle 3 = m\angle 8$

15. Point $P(6, 7)$ and point $Q(6, 4)$ are plotted on the coordinate grid below.

Point $P$ is rotated $180^\circ$ clockwise about point $Q$. What are the coordinates of the image of point $P$ after this rotation?

A. $(3, 4)$
B. $(6, 1)$
C. $(6, 10)$
D. $(9, 4)$
16. Triangle $MNP$ has vertices at $M(0, 0)$, $N(12, 0)$, and $P(12, 16)$, as shown in the diagram below.

Let point $R$ be the midpoint of $MN$. Let point $S$ be the midpoint of $NP$.

a. What are the coordinates of each of the points listed below?
   
   - point $R$
   - point $S$

   Show or explain how you got your answer for each point.

b. Is $RS$ parallel to $MP$? Show or explain how you got your answer.

c. What is the length, in units, of each of the line segments listed below?
   
   - $MN$
   - $NP$
   - $MP$

   Show or explain how you got your answer for each line segment.

d. The length of $MP$ is how many times the length of $RS$? Show or explain how you got your answer.
Grade 11 Mathematics Reference Sheet

Pi: \( \pi = 3.14 \)

FORMULAS FOR PLANE FIGURES

Parallelogram: \( A = bh \)

Trapezoid: \( A = \frac{1}{2} (b_1 + b_2)h \)

Right Triangle: 
- Pythagorean Theorem: \( c^2 = a^2 + b^2 \)
- Trigonometric Ratios:
  - \( \sin A = \frac{a}{c} \)
  - \( \cos A = \frac{b}{c} \)
  - \( \tan A = \frac{a}{b} \)

Triangle: \( A = \frac{1}{2} bh \)

Circle:
  - Circumference: \( C = 2\pi r \)
  - Area: \( A = \pi r^2 \)

FORMULAS FOR SOLID FIGURES

Prism:
  - Volume: \( V = Bh \)
  - Lateral Area: \( LA = ph \)

Right Cylinder:
  - Volume: \( V = \pi r^2 h \)
  - Surface Area: \( SA = 2\pi r^2 + 2\pi rh \)

Sphere:
  - Volume: \( V = \frac{4}{3} \pi r^3 \)
  - Surface Area: \( SA = 4\pi r^2 \)

Right Cone:
  - Volume: \( V = \frac{1}{3} \pi r^2 h \)
  - Surface Area: \( SA = \pi r (l + r) \)

Right Pyramid:
  - Volume: \( V = \frac{1}{3} Bh \)
  - Surface Area: \( SA = B + \frac{1}{2} pl \)

LA represents the lateral surface area. 
SA represents the total surface area. 
\( B \) represents the area of the base. 
\( p \) represents the perimeter of the base. 
\( l \) represents the slant height.