

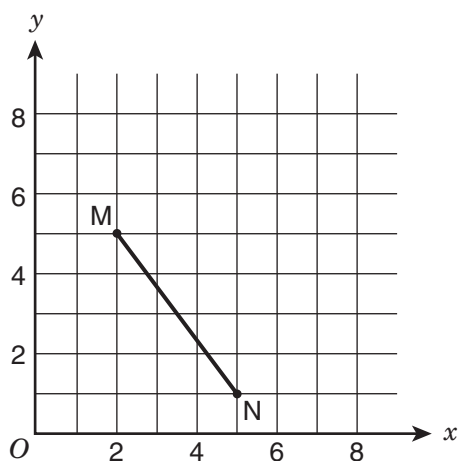
GRADE 9 MATHEMATICS SAMPLE QUESTIONS

Blank grids are provided on page 254.

1. Assume $S(x)$ equals the sum of all positive even integers less than or equal to x . What is the value of $S(7)$?

2. $\sqrt{16} \cdot \sqrt{196} =$

3.



If \overline{MN} is translated 1 unit to the left to produce $M'N'$, what is the area of parallelogram $NMM'N'$?

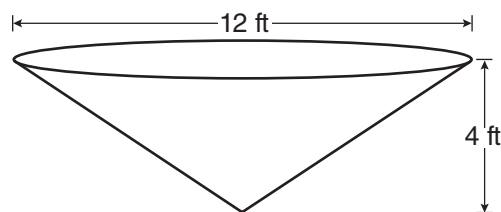
- A. 3 square units
- B. 4 square units
- C. 5 square units
- D. 6 square units

4. Simplify:

$$\frac{p^{12} \cdot p^0}{p^{-4}}$$

- E. 0
- F. p^{-3}
- G. p^8
- H. p^{16}

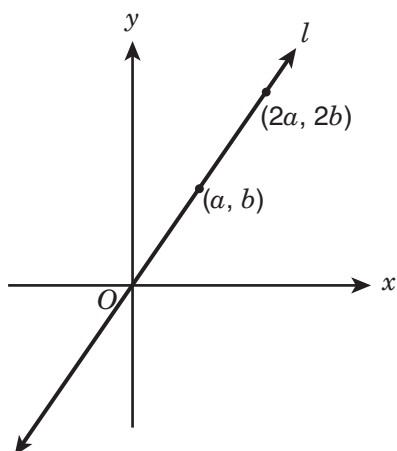
5.



Water is pumped into a tank that is shaped like the right inverted cone shown above. The cone has a base diameter of 12 feet and a height of 4 feet. What is the volume, in cubic feet, of the water in the tank when the height of the water is 2 feet?

- A. 6π cu ft
- B. 18π cu ft
- C. 24π cu ft
- D. 48π cu ft

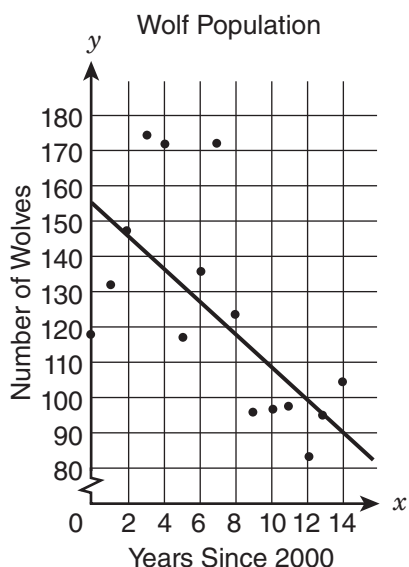
6.



Straight line l passes through the origin, as shown in the figure above. What is the slope of line l in terms of a and b ?

- E. $\frac{a}{b}$
- F. $\frac{2b}{a}$
- G. $\frac{2a}{b}$
- H. $\frac{b}{a}$

7. The graph shows the wolf population in Yellowstone National Park since 2000. A student drew a line of best fit to model the data.

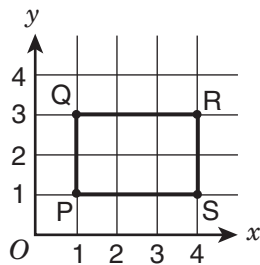


Which statement best describes the line of best fit that the student drew?

- A. The line of best fit is not a strong model for the data, because the points are not close to the line.
- B. The line of best fit is not a strong model for the data, because it does not pass through any of the data points.
- C. The line of best fit is a strong model for the data, because both the line and the data show a negative trend.
- D. The line of best fit is a strong model for the data, because about half the data points are on each side of the line.

8. To determine the price of servicing a car, a mechanic charges a fixed fee plus an hourly rate for each hour he works. If his price for 4 hours of service is \$270, and his price for 7 hours of work is \$420, what is the fixed fee that the mechanic charges?
- E. \$50
F. \$60
G. \$70
H. \$120

9.



Rectangle PQRS above is rotated 180° about the origin to form rectangle P'Q'R'S'. What are the coordinates of R'?

- A. $(4, -3)$
B. $(-4, 3)$
C. $(-4, 1)$
D. $(-4, -3)$

10.

$$\frac{15.3 \times 10^{-8}}{1.5 \times 10^4}$$

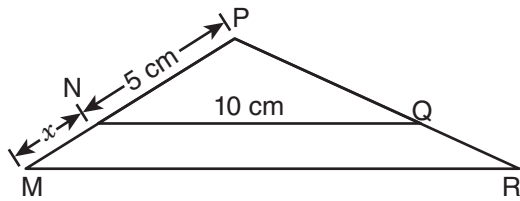
What is the quotient of the expression above, expressed in scientific notation?

- E. 1.02×10^{-13}
F. 1.02×10^{-11}
G. 1.02×10^{-4}
H. 1.02×10^{12}

11. Which of the following expressions is **negative** in value?

- A. $4 - \pi$
B. $3\pi - 9$
C. $12 - 4\pi$
D. $36 - 9\pi$

12.



In the figure above, $\triangle MPR$ is similar to $\triangle NPQ$. If the length of \overline{NQ} is 10 centimeters, what is the length of \overline{MR} in terms of x ?

E. $2x$

F. $2x + 10$

G. $x + 5$

H. $\frac{1}{2}x + 5$

13. The symbol $\langle x, y, z \rangle$ means $\frac{xz + xy}{2} + zy$. What is the value of $\langle 3, 4, 8 \rangle$?

A. 15

B. 34

C. 50

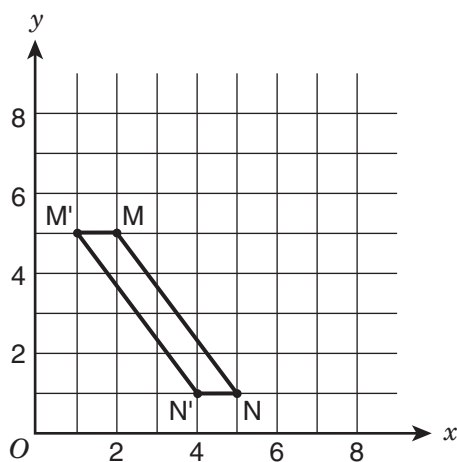
D. 56

1. **(12)** $S(x)$ is the sum of all positive even integers less than or equal to x . 1, 2, 3, 4, 5, and 6 are all integers less than 7. Take the positive integers from the list and find the sum:

$$S(7) = 2 + 4 + 6 = 12$$

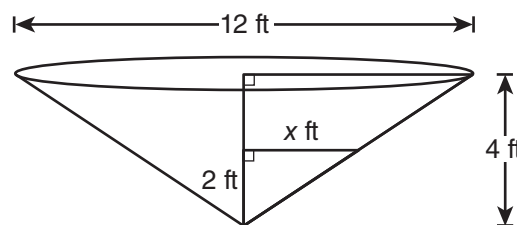
2. **(56)** $\sqrt{16} \cdot \sqrt{196} = 4 \cdot 14 = 56$

3. **(B)** When \overline{MN} is translated 1 unit left, the distance between M' and M is 1 unit, which is the base of the parallelogram. The height of the parallelogram is the vertical distance from M to N . Since M is at $y = 5$ and N is at $y = 1$, the height is $5 - 1 = 4$ units. The area of a parallelogram is base \times height, so the area is $1 \times 4 = 4$ square units.



4. **(H)** $\frac{p^{12} \cdot p^0}{p^{-4}} = (p^{12} \cdot p^0) \frac{p^4}{1} =$
 $p^{(12+0+4)} = p^{(12+4)} = p^{16}$

5. **(A)** Find the radius when the depth of the water is 2 ft. Set up two similar right triangles as shown below:



Use a proportion to find x . Since the diameter of the right inverted cone is 12 ft, the radius is 6 ft:

$$\frac{x}{6} = \frac{2}{4}$$

$$x = 3 \text{ ft}$$

Find the volume of the cone with a radius of 3 ft and a height of 2 ft:

$$V = \frac{1}{3}r^2\pi h = \frac{1}{3}(3^2)\pi(2) = 3\pi(2) = 6\pi$$

6. **(H)** Use the slope formula to figure out the slope of line l .

$$\text{Slope of line } l = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2b - b}{2a - a} = \frac{b}{a}$$

7. **(A)** The question asks to describe the line of best fit for the graph. The line of best fit is a strong model when the most of the points are close to the line as possible. In this case, very few of the points are on or next to the line. Since there aren't many points close to the line, this is not a strong model for the data.

8. **(G)** Set up the two equations and subtract them from one another to find the price per hour:

$$(y + 7x = 420) - (y + 4x = 270)$$

$$3x = 150$$

$$x = 50$$

To find the fixed fee, use one of the equations ($y + 7x = 420$ or $y + 4x = 270$) and solve for y , using $x = 50$.

$$y + 4x = 270$$

$$y + 4(50) = 270$$

$$y + 200 = 270$$

$$y = 70$$

9. **(D)** Point R is at $(4, 3)$. If (x, y) is rotated 180° about the origin:

$$R(x, y) \rightarrow (-x, -y) \text{ . Therefore,}$$

$$R(4, 3) \rightarrow (-4, -3) \text{ .}$$

10. **(F)**
$$\frac{15.3 \times 10^{-8}}{1.5 \times 10^4} = \left(\frac{15.3}{1.5} \right) \times \frac{10^{-8}}{10^4} =$$

$$10.2 \times \frac{10^{-8}}{10}$$

Use the rule of exponents to simplify.

$$10.2 \times 10^{(-8-4)} = 10.2 \times 10^{-12}$$

Rewrite the answer so that it is standard scientific notation form.

$$1.02 \times 10^{-11}$$

11. **(C)** Substitute the approximation $\pi = 3.14$ into each expression and solve to find which expression results in a negative value:

$$4 - \pi = 0.86$$

$$3\pi - 9 = 0.42$$

$$12 - 4\pi = -0.56$$

$$36 - 9\pi = 7.74$$

So, the answer is $12 - 4\pi$.

- 12. (F)** Triangles NPQ and MPR are similar. Corresponding sides of the triangles are proportional. Set up a proportion to find \overline{MR} .

$$\frac{\overline{MR}}{\overline{MP}} = \frac{\overline{NQ}}{\overline{NP}}$$

$$\frac{\overline{MR}}{x + 5} = \frac{10}{5}$$

$$5(\overline{MR}) = 10(x + 5)$$

$$5(\overline{MR}) = 10x + 50$$

$$\overline{MR} = 2x + 10$$

- 13. (C)** $x = 3$, $y = 4$, and $z = 8$. Substitute those values into the equation and simplify.

$$\frac{(3 \cdot 8) + (3 \cdot 4)}{2} + (8 \cdot 4) =$$

$$\frac{24 + 12}{2} + 32 =$$

$$\frac{36}{2} + 32 =$$

$$18 + 32 = 50$$

Answer Key for Grade 9 Mathematics

- | | | |
|-------|-------|-------|
| 1. 12 | 6. H | 11. C |
| 2. 56 | 7. A | 12. F |
| 3. B | 8. G | 13. C |
| 4. H | 9. D | |
| 5. A | 10. F | |