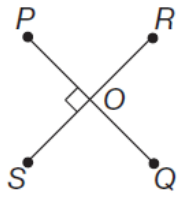
▶ Part 4: Mathematics Knowledge

Time: 24 minutes

1. In the figure below, angle *POS* measures 90°. What is the measure of angle *ROQ*?



a. 45°
b. 90°
c. 180°
d. 270°

2. $4\frac{1}{5} + 1\frac{2}{5} + 3\frac{3}{10} =$

a. $8\frac{9}{10}$
b. $9\frac{1}{10}$
c. $8\frac{4}{5}$
d. $8\frac{6}{15}$

3. $\frac{4}{5}$ is equivalent to which of the following?

a. 0.45
b. $\frac{5}{4}$
c. 8%
d. 80%

4. What is the decimal equivalent of $\frac{1}{3}$, rounded to the nearest hundredth?

a. 0.13
b. 0.33
c. 0.50
d. 0.67

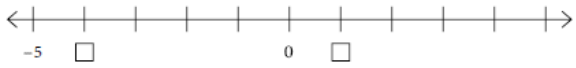
5. $4\frac{1}{3} + 3\frac{2}{5} - 2\frac{14}{15} =$

a. $4\frac{12}{15}$
b. $5\frac{3}{15}$
c. $10\frac{2}{3}$
d. $51\frac{1}{7}$

6. What is another name for 20,706?

a. 200 + 70 + 6
b. 2,000 + 700 + 6
c. 20,000 + 70 + 6
d. 20,000 + 700 + 6

7. What are the missing integers on this number line?



a. –4 and 1
b. –6 and 1
c. –6 and –1
d. 4 and 9

Answers

Part 4: Mathematics Knowledge

1. b. $\overline{PQ}$ and $\overline{RS}$ are intersecting lines. The fact that $\angle POS$ is a 90-degree angle means that $\overline{PQ}$ and $\overline{RS}$ are perpendicular, indicating that all the angles formed by their intersection, including $\angle ROQ$, measure 90°.

2. a. Incorrect answers include adding both the numerator and the denominator and not converting fifths to tenths properly.

3. d. To convert a fraction to a percent, change the denominator to 100 with multiplication. (Multiply the denominator and the numerator by the same number, so that you do not change the value of the original fraction). For example, $\frac{4}{5} \times \frac{20}{20} = \frac{80}{100}$, which is equivalent to 80%. Another way to consider this problem is to change it to a decimal first by dividing the numerator, 4, by the denominator, 5; $4.00 \div 5 = 0.80 = 80\%$.

4. b. Divide the numerator by the denominator; $1.000 \div 3 = 0.33\overline{3}$. Round the answer to the hundredths place (two decimal places) to get the answer 0.33.

5. a. First, consider the addition: $4\frac{1}{3} + 3\frac{2}{5}$. In order to add or subtract fractions, they must have common denominators. Since both of the numerators (3 and 5), are factors of 15, use 15 as your common denominator.

$\frac{1}{3} \times \frac{5}{5} = \frac{5}{15}$, so $4\frac{1}{3} = 4\frac{5}{15}$.
$\frac{2}{5} \times \frac{3}{3} = \frac{6}{15}$, so $3\frac{2}{5} = 3\frac{6}{15}$.

Then, add the mixed numbers with common denominators:

$4\frac{5}{15} + 3\frac{6}{15} = 7\frac{11}{15}$.

Then, $7\frac{11}{15} - 2\frac{14}{15}$ must be calculated. Since the numerator of the first fraction, 11, is smaller than the numerator of the second fraction, 14, borrow one whole number from the 7 in $7\frac{11}{15}$, changing it to 6, and add $\frac{15}{15}$ to $\frac{11}{15}$ to get $\frac{26}{15}$. Therefore, $7\frac{11}{15} = 6\frac{26}{15}$.

Lastly, $6\frac{26}{15} - 2\frac{14}{15} = 4\frac{12}{15}$.

6. d. Choice **a** reads 276; choice **b** reads 2,706; choice **c** reads 20,076.

7. a. The first box is one greater than –5; the second is one greater than 0.

8. Which of the following is divisible by 3, 7, and 8?
- a. 21
- b. 24
- c. 56
- d. 168

9. What is another way to write $4 \times 4 \times 4$?
- a. 3×4
- b. 8×4
- c. 4^3
- d. 3^4

10. Which of these is equivalent to 35° C? ($F = \frac{9}{5}C + 32$)
- a. 105° F
- b. 95° F
- c. 63° F
- d. 19° F

11. What is the volume of a pyramid that has a rectangular base 5 feet by 3 feet and a height of 8 feet? ($V = \frac{1}{3}lwh$)
- a. 16 feet^3
- b. 30 feet^3
- c. 40 feet^3
- d. 120 feet^3

12. How many inches are there in $3\frac{1}{3}$ yards?
- a. 126
- b. 120
- c. 160
- d. 168

13. $\frac{13}{4} =$
- a. 3.40
- b. 4.25
- c. 3.75
- d. 3.25

14. 125% is equivalent to
- a. 0.125
- b. 1.25
- c. 12.5
- d. 125

15. Triangle *ABC* is an isosceles triangle, with a base length of 14 inches. If its perimeter is 3 feet, what is the length of each of the legs of triangle *ABC*?
- a. 36 inches
- b. 18 inches
- c. 22 inches
- d. 11 inches

16. Which value of x will make the following number sentence true?

$$x + 25 = 13$$

- a. –13
- b. –11
- c. –12
- d. 38

17. How many faces does a cube have?
- a. 4
- b. 6
- c. 8
- d. 12

18. What is the length of a rectangle if its width is 9 feet and its area is 117 square feet?
- a. 1.3 feet
- b. 10.5 feet
- c. 12 feet
- d. 13 feet

19. A square is a special case of all of the following geometric figures EXCEPT a
- a. parallelogram.
- b. rectangle.
- c. rhombus.
- d. trapezoid.

Answers

8. **d.** 168 is the only number that can be divided by 3, 7, and 8. $168 \div 3 = 56$, $168 \div 7 = 24$, $168 \div 8 = 21$.

9. **c.** The meaning of 4^3 is 4 times itself 3 times.

10. **b.** Use 35 for C; $F = (\frac{9}{5} \times 35) + 32$. Therefore $F = 63 + 32$, or 95°.

11. **c.** $5(3)(8) = 120$; $120 \div 3 = 40$.

12. **b.** To solve this problem, you must first convert yards to inches. There are 36 inches in a yard; $36(3\frac{1}{3}) = 120$.

13. **d.** To change a fraction into decimal, divide the numerator by the denominator: $13 \div 4 = 3.25$. Another way to consider this problem is to change $\frac{13}{4}$ into a mixed fraction by dividing 13 by 4 to get 3, with $\frac{1}{4}$ left over: $\frac{13}{4} = 3\frac{1}{4} = 3.25$.

14. **b.** Percent means "out of 100." In order to turn a percent into a decimal, divide it by 100: $125\% = \frac{125}{100} = 1.25$. (When dividing a number by a power of 10 such as 10, 100, or 1,000, simply move the decimal point of the numerator one place to the left for every zero in the denominator.)

15. **d.** An isosceles triangle has two equal legs and one base. The perimeter of the triangle is 3 feet, which is equivalent to 36 inches (12 inches in every foot). The base is 14 inches, so the sum of the two legs is 36 inches – 14 inches = 22 inches. Since both legs are of equal length, $22 \div 2 = 11$ inches for each leg.

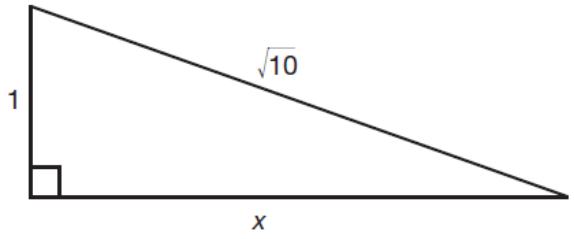
16. **c.** Since the solution to the problem $x + 25 = 13$, $x = -12$.

17. **b.** A cube has four sides, a top, and a bottom, which means that it has six faces.

18. **d.** To solve this problem, you should use the formula $A = lw$, or $117 = 9l$. Next, you must divide 117 by 9 to find the answer.

19. **d.** A square is a special case of all of these figures except the trapezoid. A square is a parallelogram because its opposite sides are parallel, a rectangle because it is a quadrilateral with 90-degree angles, and a rhombus because it is a parallelogram with all sides equal in length. However, a square is not a trapezoid because a trapezoid has only two sides parallel.

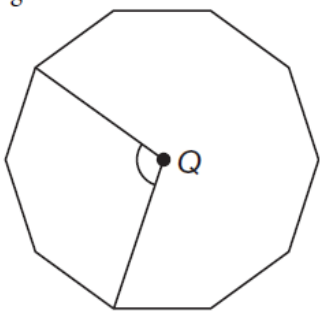
20. What is the value of x in the figure below?



a. 2
b. 3
c. 5
d. 9

21. $5\frac{2}{3}$ is closest to
a. 5.23
b. 5. 33
c. 0.523
d. 5.67

22. If the figure below is a regular decagon with a center at Q, what is the measure of the indicated angle?

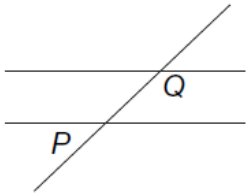


a. 36°
b. 45°
c. 90°
d. 108°

23. Negative 2.07 is equal to
a. $-2\frac{7}{10}$
b. $-2\frac{7}{100}$
c. $-2\frac{7}{1000}$
d. –2.7
e. –2.70

24. 62.5% is equal to
a. $\frac{1}{16}$.
b. $\frac{5}{8}$.
c. $6\frac{1}{4}$.
d. $6\frac{2}{5}$.

25. A line intersects two parallel lines in the following figure. If $\angle P$ measures 40°, what is the measure of $\angle Q$?



a. 50°
b. 60°
c. 80°
d. 140°

Answers

20. b. The Pythagorean theorem states that the square of the length of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides, so we know that $1^2 + x^2 = (\sqrt{10})^2$, so $1 + x^2 = 10$, so $x^2 = 10 - 1 = 9$, so $x = 3$.

21. d. $\frac{2}{3} = 0.6666$ repeating, so $5\frac{2}{3}$ is equivalent to 5.66666 or 5.67.

22. d. If the figure is a regular decagon, it can be divided into ten equal sections by lines passing through the center. Two such lines form the indicated angle, which includes three of the ten sections; $\frac{3}{10}$ of $360^\circ = 108^\circ$.

23. b. The 7 is in the hundredths place, therefore, 0.07 is equal to $\frac{7}{100}$, and $2.07 = 2\frac{7}{100}$. "Negative 2.07" is equal to $-2\frac{7}{100}$.

24. b. 62.5% is $\frac{62.5}{100}$. You should multiply both the numerator and denominator by 10 to move the decimal point, resulting in $\frac{625}{1{,}000}$, and then factor both the numerator and denominator to find out how far you can reduce the fraction; $\frac{625}{1{,}000}$ equals $\frac{(5)(5)(5)(5)}{(5)(5)(5)(8)}$. If you cancel the three 5s that are in both the numerator and denominator, you will get $\frac{5}{8}$.

25. d. A line that intersects two parallel lines forms supplementary angles on either side of it. Supplementary angles are angles whose measures add up to 180°; $180 - 40 = 140$.