

MAP TEST #1

Numbers & Operations

Base Ten

Negative number addition and subtraction: word problems

1. The Tunnel of Fear ride climbs straight up to its peak 50 meters above the ground. Then, it drops 65 meters into an underground tunnel. What is the elevation of the tunnel relative to the ground?

Answer -15 meters

Substitution with negative numbers

2. Evaluate $-a+(-b)$ where $a = 6.05$ and $b = 3.611$

Answer -9.661

Fractions

3. Which expression is equivalent to the following complex fraction?

$$\frac{\frac{-a}{-b}}{\frac{c}{d}}$$

A. $\frac{-a}{-b} \div \frac{c}{d}$

B. $\frac{c}{d} \div \frac{-a}{-b}$

C. None of the above

Answer A

Operations and Algebra

Represent and Solve Problems

Two-step equations

4. Solve for x. $-30=5(x+1)$

Answer $x=-7$

Multi-step linear inequalities

5. Solve for x. Give an exact answer in simplified form.

$$4x+4 \leq 9x+8$$

Answer $x \geq -4/5$

6. Solve for y. Give an exact answer in simplified form.

$$5y+3 > -7y + 13$$

Answer $y > 5/6$

Expressions and Equations

Equations with variables on both sides

7. Solve for g. $-3+5+6g=11-3g$

Answer $g=1$

Nested fractions

8. Which expression is equivalent to $\frac{\frac{2+y}{y}+2}{y}$? Assume $y \neq 0$.

A $\frac{4+y^2}{2y^2}$

B $\frac{1}{y}$

C $2y$

D 2

Answer A

9. Which expression is equivalent to $\frac{\frac{q}{r}+1}{\frac{r}{q}-1}$?

Assume $q \neq 0$, $r \neq 0$, and $q \neq r$

A $-\frac{q}{r}$

B $-\frac{q^2}{r^2}$

C $\frac{q+r}{q-r}$

D $\frac{q(q+r)}{r(r-q)}$

Answer D

10. Which expression is equivalent to $\frac{\left(\frac{2}{x+y}\right)}{\left(\frac{x+y}{2}\right)}$?

A $x+y$

B $\frac{4}{(x+y)^2}$

C $\frac{x+y}{2}$

D 1

Answer B

Equations with parentheses: decimals & fractions

11. Solve for f Give an exact answer.

$$4(0.5f-0.25) = 6+f$$

Answer $f = 7$

12. Solve for k. Give an exact answer.

$$\frac{1}{4}k = 3\left(-\frac{1}{4}k + 3\right)$$

Answer $k = 9$

13. Solve for h. Give an exact answer.

$$3h = 7\left(\frac{2}{7} - \frac{3}{7}h\right) - 10$$

Answer $h = -4/3$

Linear equations with unknown coefficients

14. Solve for x. $ax+3x = bx+5$

Answer $x = 5/(a+3-b)$

Compound inequalities

15. Solve for x.

$$-8x+14 \geq 60 \text{ or } -4x+50 < 58$$

A $x \leq -\frac{23}{4}$ or $x > -2$

B $x \leq -\frac{23}{4}$

C $x > -2$

D There are no solutions

E All values of x are solutions

Answer A

16. Solve for x.

$$4x-4 < 8 \text{ and } 9x+5 > 23$$

A $2 < x < 3$

B $x < 2$ or $x > 3$

C There are no solutions

D All values of x are solutions

Answer A

17. Solve for x.

$$5x-29 > -34 \text{ or } 2x+31 < 29$$

A $x < -1$ or $x > -1$

B $x < -1$

C $x > -1$

D There are no solutions

E All values of x are solutions

Answer A

Systems of equations with elimination

18. Solve the system of equations.

$$3x + 8y = 15$$

$$2x - 8y = 10$$

Answer (5,0)

19. Solve the system of equations.

$$-3y + 5x = 26$$

$$-2y - 5x = -16$$

Answer (4,-2)

Systems of equations with substitution

20. Solve the system of equations.

$$12x - 5y = -20 \quad y = x + 4$$

Answer (0,4)

Linear models word problems

21. Wang Yong owes the bank \$8500. To repay the debt, he paid a fixed amount back to the bank each month. After 12 months, his remaining debt was \$6460. How much did Wang Yong pay each month?

Answer 170

How long did it take Wang Yong to pay back his entire debt?

Answer 50

22. Andrei has a glass tank. First, he wants to put in some marbles, each of which has a volume of 0.04 liters. Then, he wants to fill the tank with water until it's completely full. If he uses 50 marbles, he will have to add 33 liters of water. What is the volume of the tank?

Answer 35 $(50 \cdot 0.04) + 33$

Andrei has exactly 20 liters of water. How many marbles does he need so the tank is full?

Answer 375 $(35 - 20) / 0.04$

Systems of equations word problems

23. Giselle works as a carpenter and as a blacksmith. She earns \$20 per hour as a carpenter and \$25 per hour as a blacksmith. Last week, Giselle worked both jobs for a total of 30 hours, and earned a total of \$690. How long did Giselle work as a carpenter last week, and how long did she work as a blacksmith?

Answer (12,18)

24. A plane has 360 total seats, which are divided into economy class and business class. For every 13 seats in economy class, there are 5 seats in business class. How many seats are there in each class?

Answer (260,100)

25. Sakura speaks 150 words per minute on average in Hungarian, and 190 words per minute on average in Polish. She once gave cooking instructions in Hungarian, followed by cleaning instructions in Polish. Sakura spent 5 minutes total giving both instructions, and spoke 270 more words in Polish than in Hungarian. How long did Sakura speak in Hungarian, and how long did she speak in Polish?

Answer (2,3)

26. Wolfrich lived in Portugal and Brazil for a total period of 14 months in order to learn Portuguese. He learned an average of 130 new words per month when he lived in Portugal, and an average of 150 new words per month when he lived in Brazil. In total, he learned 1920 new words. How long did Wolfrich live in Portugal and how long did he live in Brazil?

Answer (9,5)

27. A battery was charged. When the charging began, it was 23 percent full. After 30 minutes of charging, the battery was 89 percent full. How fast was the battery charged?

Answer 2.2 percent per minute $(89-23)/30$

How long did it take the battery to be fully charged?

Answer 35 $(100-23)/2.2$

Factor polynomials: quadratic methods

28. Factor completely.

$$x^2 - 3xy - 10y^2$$

Answer $(x-5y)(x+2y)$

Factor quadratics by grouping

29. Factor the quadratic expression completely.

$$12x^2+17x+6$$

Answer $(4x+3)(3x+2)$

Systems of inequalities word problems

30. Members of the swim team want to wash their hair. The bathroom has less than 5600 liters of water and at most 2.5 liters of shampoo. $70L+60S < 5600$ represents the number of long-haired members L and short-haired members S who can wash their hair with less than 5600 liters of water $0.02L+0.01S \leq 2.5$ represents the number of long-haired members and short-haired members who can wash their hair with at most 2.5 liters of shampoo. Does the bathroom have enough water and shampoo for 8 long-haired members and 7 short-haired members?

A The bathroom has enough water and shampoo.

B The bathroom has enough water but not enough shampoo.

C The bathroom has enough shampoo but not enough water.

D The bathroom has neither enough water nor enough shampoo.

Answer A

Solve equations using structure

31. Find one value of x that is a solution to the equation:

$$(3x-1)^2+12x-4 = 0$$

Answer $x = 1/3, -1$

Solve exponential equations using exponent properties

32. Solve the exponential equation for x.

$$2^{9x+2} = 16^{5x-2}$$

Answer $x = 10/11$

Quadratic formula

33. Solve. $-7x^2 + 7x + 1 = -8$

A $x = \frac{-7 \pm \sqrt{301}}{-14}$

B $x = -1, \frac{7}{10}$

C $x = \frac{2 \pm \sqrt{5}}{-2}$

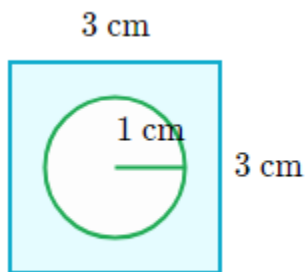
D $x = \frac{1 \pm \sqrt{57}}{-8}$

Answer A

Measurement and Data

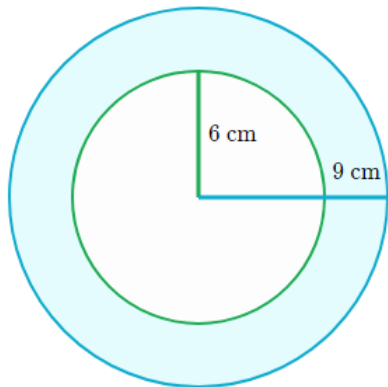
Shaded areas

34. A circle with radius of 1 cm sits inside a 3cmx3cm rectangle. What is the area of the shaded region?



Answer $(9-\pi)$ or 5.86 cm^2

35. A circle with radius of 6 cm sits inside a circle with radius of 9 cm. What is the area of the shaded region?



Answer (45π) or $(141.43 \text{ if } \pi = 22/7)$ or $(141.3 \text{ if } \pi = 3.14)$

Real and Complex Numbers

Extend and Use Properties

Properties of exponents challenge (integer exponents)

36. Which expressions are equivalent to $(5^3 \cdot 5^2)^4$?

A 25^{20}

B $(25^5)^4$

C None of the above

Answer C

Simplify square-root expressions

37. Simplify. Multiply and remove all perfect squares from inside the square roots. Assume x is positive.

$$2\sqrt{7x} \cdot 3\sqrt{14x^2}$$

Answer $42x\sqrt{2x}$

Statistics and Probability

Interpreting Categorical and Quantitative Data

Estimating slope of line of best fit

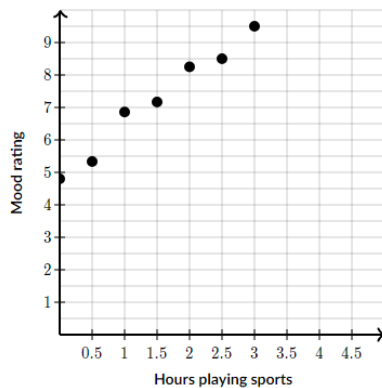
38. Jacob distributed a survey to his fellow students asking them how many hours they'd spent playing sports in the past day. He also asked them to rate their mood on a scale from 0 to 10, with 10 being the happiest. Which of the following is the best estimate of the average change in mood rating associated with a 1-hour increase in hours playing sports?

A 1.5 points

B 4 points

C 7 points

D 9.5 points



Answer A

Using Sampling and Probability to Make Decisions

Dependent and independent events

39. Urpi and Manco are playing a game where they flip a fair coin four times and try to predict the outcomes. Using the sample space of possible outcomes listed below, answer each of the following questions.

What is $P(A)$, the probability that the second flip is heads

Answer $\frac{1}{2}$

What is $P(B)$, the probability that the fourth flip is heads?

Answer $\frac{1}{2}$

What is $P(A \text{ and } B)$, the probability that the second flip is heads and the fourth flip is heads?

Answer $\frac{1}{4}$

Dependent probability

40. A jar contains 4 red marbles, 4 green marbles, and 5 blue marbles. If we choose a marble, then another marble without putting the first one back in the jar, what is the probability that the first marble will be blue and the second will be green?

Answer $\frac{5}{39}$

41. In a class of 10, there are 2 students who forgot their lunch. If the teacher chooses 2 students, what is the probability that both of them forgot their lunch?

Answer $\frac{1}{45}$

Adding probabilities

42. There are 500 students in a high school senior class. Of these 500 students, 300 regularly wear a necklace to school, 200 regularly wear a ring, and 125 regularly wear a necklace *and* a ring. Using this information, answer each of the following questions.

Let N be the event that a randomly selected senior regularly wears a necklace and R be the event that a randomly selected senior regularly wears a ring.

What is $P(N)$ the probability that a senior wears a necklace?

What is $P(R)$, the probability that a senior wears a ring?

What is $P(N \text{ and } R)$, the probability that a senior wears a necklace *and* a ring?

What is $P(N \text{ or } R)$, the probability that a senior wears a necklace *or* a ring?

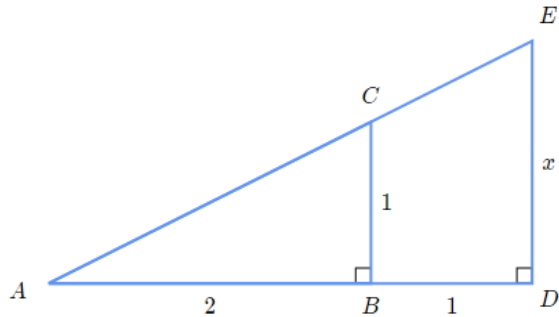
Answer $\frac{3}{5}$, $\frac{2}{5}$, $\frac{1}{4}$, $\frac{3}{4}$

Geometry

Congruence, Similarity, Right Triangles, & Trig

Solve similar triangles (advanced)

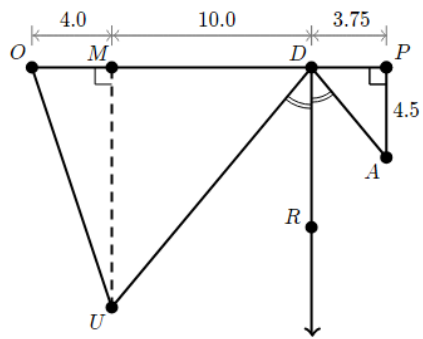
43. Solve for x .



Answer 1.5

Use similar & congruent triangles

44. In the diagram below, $\overrightarrow{DR}$ is perpendicular to $\overline{OP}$

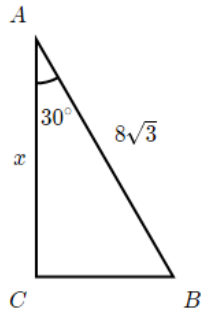


Find the area of $\triangle DUO$.

Answer 84 cm^2

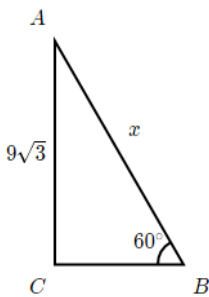
Special right triangles

45. In the right triangle shown, $\angle A = 30^\circ$ and $AB = 8\sqrt{3}$. How long is AC ?



Answer 12

46. In the right triangle shown, $\angle B = 60^\circ$ and $AC = 9\sqrt{3}$. How long is AB ?

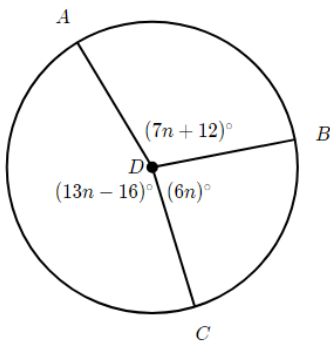


Answer 18

Geometric Measurement and Relationships

Arc measure with equations

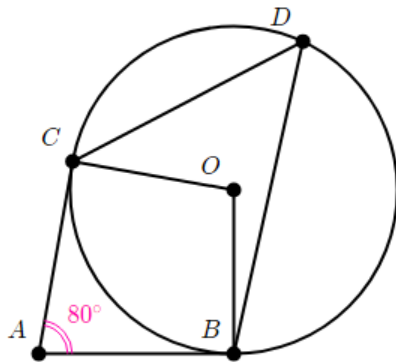
47. Circle D is below. What is the arc measure of $\widehat{BC}$ in degrees?



Answer 84

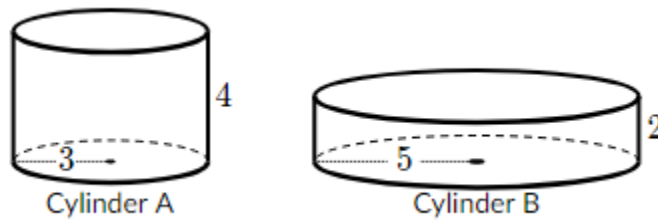
Tangents of circles problems

48. Angle A is circumscribed about circle O. What is the measure of $\angle D$?



Answer 50

49. What is the ratio of the volume of Cylinder A to the volume of Cylinder B?



A $\frac{18}{25}$

B $\frac{5}{6}$

C $\frac{6}{5}$

D $\frac{25}{18}$

Answer a

Midpoint formula

50. Point A is at $(-3, -5)$ and point B is at $(1, -9)$. What is the midpoint of line segment $\overline{AB}$?

Answer $(-1, -7)$