New SAT Math Diagnostic Test

Solve and Graph Linear Equations

1. Solve for z: $\dfrac{4+z-(3+2z)}{6} = \dfrac{-z-3(5-2)}{7}$

2. Given the table of values:

x	-9	0	3	9
y	11	8	7	?

If the values in the table represent a linear relationship, what is the missing value?

3. If the graph of the line y = -5x + 8 is shifted down 3 units and left 2 units, what is the slope of the new line?

4. A store "breaks even" when its sales equal its expenses. Jon operates a surfboard store where he buys each surfboard wholesale for $80 and has fixed monthly expenses of $3600. He sells each surfboard for $120. How many surfboards does Jon need to sell in a month to break even?

Solving Systems

5. Solve the system: 28x – 5y = 36
   15x + 5y + 18 = 68

6. A toy store sells small stuffed pandas for $3.50 and giant stuffed pandas for $14.00. If the store sells 29 pandas and made $217 in revenue in one week, how many small stuffed pandas were sold?

7. Given the system: $3x - 9y = -6$

$$\frac{1}{2}x - \frac{3}{2}y = c$$

If the system has infinitely many solutions and c is a constant, then what is the value of c?

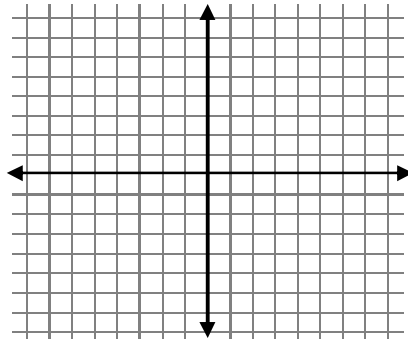**Solving Inequalities**

8. Graph the linear inequality: $5x - 2y > 6$

9. Solve the inequality: $\dfrac{1}{5}(7 - 3b) > 2$

10. Marco is paid $80 per day plus $15 per hour overtime. If he works five days per week and wants to make a minimum of $520 this week, what is the fewest number of hours of overtime he must work?

Linear and Proportional Relationships

11. Quinn wants to rent a self-storage unit. She estimates that she will need 700 cubic feet of storage space, but the self-storage provider measures its units in cubic meters. If 1 meter is approximately 3.28 feet, about how many cubic meters of space will Quinn need?

12. A tutoring service offers a free one-hour tutoring session. After a client signs up, the next 10 hours of tutoring are billed at a rate of $30 per hour. For all hours after that, the client receives a discounted rate. If the client pays $664 for 25 hours of tutoring, what is the service's discounted hourly rate?

13. Margo purchases a coffee maker with an original price of $62.00. After a sale discount, she gets an additional 10% off for using her store credit card. She ends up paying $41.85, not including tax. What was the amount of the original sale discount as a percent?

Answers

8. See Graph

9. _____

10. _____

11. _____
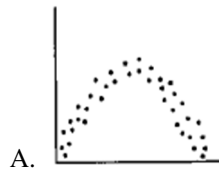
12. _____

13. _____

8. See Graph

Scatterplots

14. Which of the following is the best estimate for the slope of the line that best fits the data shown in the scatterplot below?

A. -3

B. $\dfrac{-1}{3}$

C. $\dfrac{1}{3}$

D. 3

15. Match each of the scatterplots below with the regression equation that best models the Relationship of the data:
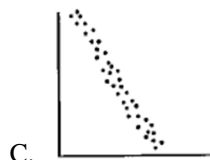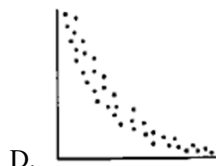
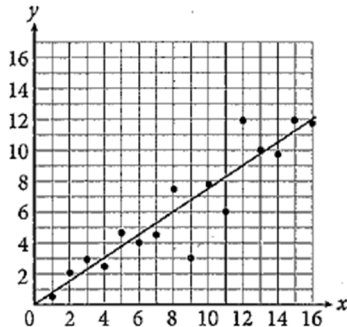1. $y = ax + b$, where a > 0

A.

2. $y = ax + b$, where a < 0

B.

3. $y = ax^2 + bx + c$, where a < 0

C.

4. $y = ab^{kx}$, where k < 0

D.

16. What is the y-value of the data point that has the highest percent error from the mean of the data shown in the scatterplot below?
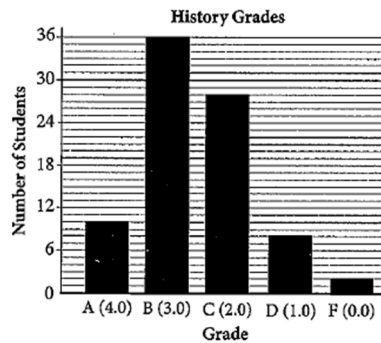
Probability and Statistics

17. A fair coin is flipped five times. What is the probability that at least four of the
    Five flips will be heads?

18. Given the table of results below from a breakfast study: What percent of the participants
    who were outside a healthy range ate breakfast one or fewer times per week?

Breakfast Study Results

	Breakfast ≤1 time per week	Breakfast 2-4 times per week	Breakfast 5-7 times per week	Total
Within Healthy Weight Range	6	15	36	57
Outside Healthy Weight Range	38	27	9	74
Total	44	42	45	131

19. Given the distribution of history grades and corresponding GPA scores among a group
    of students shown below: What is the mean history GPA for this class of students?

History Grades

20. On a used car lot, 50% of the vehicles are cars, $\frac{3}{4}$ of which have automatic transmissions.

    Of the cars with automatic transmissions, $\frac{1}{3}$ have leather interiors. If a vehicle is chosen
    from the lot at random, what is the probability that it will be a car with an automatic
    transmission and a leather interior?

Exponents, Polynomials, Radicals

21. Simplify: $2(-4j^3k^{-4})^{-3}$

22. Simplify: $\dfrac{\sqrt[6]{x^{10}y^{12}}}{\sqrt[3]{x^5y^6}}$

Answers

17. _____

18. _____

19. _____

20. _____

21. _____

22. _____

23. Simplify: $\dfrac{4x+8y}{24x-12}$

24. Solve for x: $8+\dfrac{\sqrt{2x+29}}{3}=9$

Advanced Polynomial and Rational Operations

25. Solve for x: $\dfrac{4}{x}+\dfrac{2}{x-8}=\dfrac{-2}{x^2-8x}$

26. What is the remainder when $16a^2+3$ is divided by $4a+2$

27. Factor: $25x^2y^4-1$

Functions

28. If $g(x)=-2x^2+7x-3$, what is the value of $g(-2)$?

29. Given the piecewise function defined below:

$$f(x)=\begin{cases} x^2+1, & if \quad x\le 0 \\ \dfrac{2x}{3}-1, & if \quad 0<x\le 3 \\ 4-x, & if \quad x>3 \end{cases}$$

What is the value of $f(-3)$

30. A company uses the function $P(x)=150x-x^2$ to determine how much profit the company will make when it sells 150 units of a certain product that sells for x dollars per unit. How much more profit per unit will the company make if it charges $25 for the product than if it charges $20?
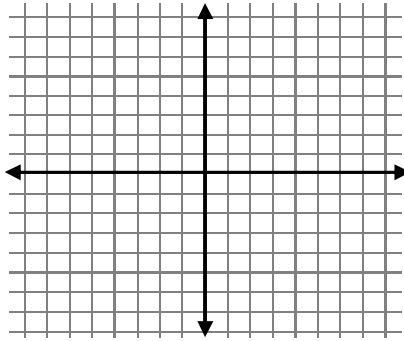
Quadratics

31. Simplify: $\dfrac{x^2 - 10x + 25}{3x^2 - 75}$

32. Find the x-intercepts of the function $f(x) = 3x^2 - 2x - 8$

33. Sketch a graph of the equation $y = x^2 + 2x - 8$

showing the x-intercepts, y-intercept, and vertex

34. Solve the system:

$$y = 2x$$
$$2x^2 + 2y^2 = 240$$

35. Find the axis of symmetry of the graph of $y = 3x^2 + 12x - 8$

Imaginary Numbers

36. Simplify: $(2i - 3) - (6 + 4i)$

37. Solve for x: $y = x^2 - 4x + 5$

38. Simplify: $i^{14} + i^{122}$

39. Simplify: $\dfrac{2 + i}{5 - i}$ (write your answer in $a + bi$ form)

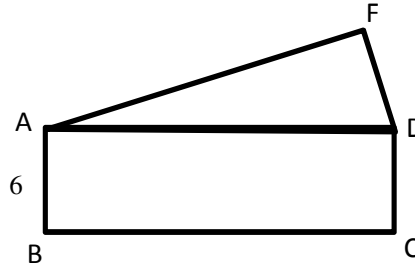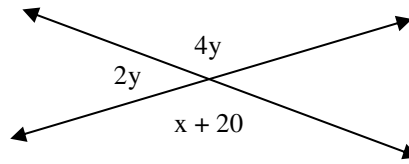**Angles and Triangles**

40. Given: angle F is a right angle
    perimeter of rectangle ABCD = 30
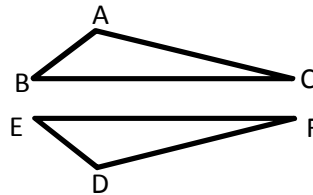   AB = 6
    FD = DC

   Find the length of FA in the figure

41. Find the value of x in the diagram:

4y

2y

x + 20

Similarity and Congruence

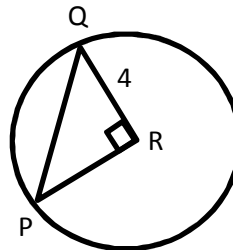42. Given the triangles shown at the right:

   If $\angle A \cong \angle D$ and $\overline{AB} \cong \overline{DE}$, what additional information
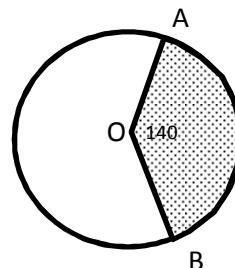   Is needed to prove $\triangle ABC \cong \triangle DEF$ by the ASA theorem?

43. If $\triangle TIM \sim \triangle JOE$, $m\angle T = 40°$, and $m\angle I = 65°$, what is the measure of $\angle E$?

Circles

44. Find the length of the chord PQ in the circle
    Given the radius of the circle = 4 and R is a right angle

4

R

Q

P

45. If the area of the shaded sector in circle O is

   14π square units, and the measure of $\angle AOB = 140°$
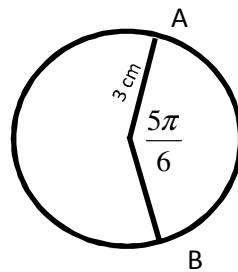   find the radius of the circle.

A

O 140

B

Solids

46. Find the volume of a cubical box that has a surface are of 1,176 square inches.

47. Find the volume of a cone with base diameter = 14 cm and height = 36 cm.

Trigonometry

48. If $\tan x = \dfrac{7}{24}$, then what is $\sin x$?

49. Find the length of minor arc AB in the figure.

50. A 17 foot ladder leans against the side of a house and makes a $65°$ angle with the ground. How far is the base of ladder from the house?

46. _____

47. _____

48. _____

49. _____

50. _____