# ALGEBRA II

The problems in this packet are designed to help you review topics that are important to your success in Algebra 2. All work must be shown for each problem – use the space provided and/or attach additional pages if necessary. Circle all final solutions. The problems should be completely attempted.

**Show all work for all problems.**

1. Complete these fraction operations WITHOUT the use of a calculator. Answer in simplest form. You must show all of your steps.

   a. $\frac{2}{3}+\frac{4}{9}$

   b. $\frac{7}{4}-\frac{4}{5}$

   c. $\frac{4}{3}*\frac{2}{9}$

   d. $15*\frac{3}{8}$

2. Evaluate the expression if $x = 3$ and $y = -2$

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

3. Solve the following equations. Show your work AND check your answers.

   a. $(x - 1) - (4x + 6) = 8$

   b. $-2(3x - 1) = 5x + 3(x - 4)$

   c. $5(-x + 2) = 3 - 2x - 3x + 7$

   d. $2(x + 2) - 2 = 3 - (x - 3)$

4. A car salesman's weekly salary is a base amount plus an additional amount for each car sold. The table below shows a person's weekly salary earned for the last three weeks.

| Cars sold (c ) | Weekly salary (S) |
|---|---|
| 4 | $500 |
| 9 | $1000 |
| 12 | $1300 |

**a.** Write an equation to determine ( $S$) the weekly salary for ($c$) number of cars sold.

**b.** What is the person's weekly salary when 13 cars are sold?

5. Solve the following equations by clearing fractions FIRST. **Leave exact solutions (improper fractions).**

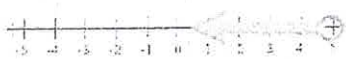
**a.** $\frac{4}{9}x + 5 = -\frac{2}{3}x - 8$

**b.** $\frac{2x+1}{3} = \frac{5x-1}{4}$

6. Indicate the solutions shown on the number line using inequality statement(s).

**a.**

**b.**



7. Line $l$ contains the points $(-2, 3)$ and $(1, 5)$. Write the equation of the line in slope-intercept form.

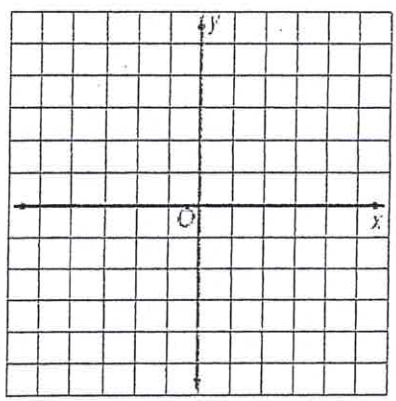
8. Find the value of $r$ so that the line that passes through the pair of points has the given slope.
**use the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$

a. $(11, 6), (-11, r), m = \frac{8}{11}$

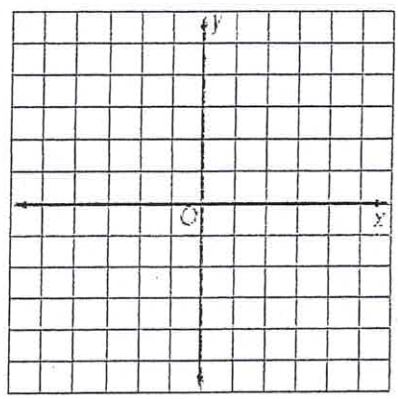
b. $(10, r), (4, -3),\ m = \frac{4}{3}$

9. Graph the following equations:

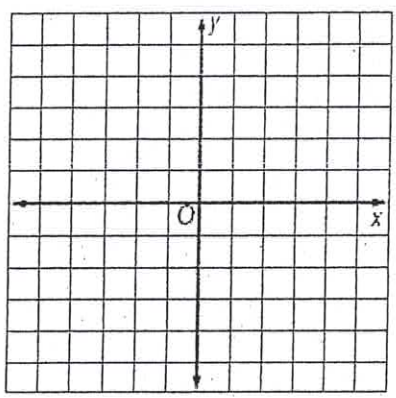
a. $y = 2x - 3$




b. $-2x + 3y = 6$




c. $x = -4$



**10.** Convert the following linear equations to standard form.

**a.** $y - 5 = 3(2x - 1)$ to slope-intercept form $\{y = mx + b\}$

**b.** $y + 1 = -2(x + 4)$ to standard form $\{ax + by = c\}$

**c.** $5x - 2y = 8$ to standard form $\{ax + by = c\}$

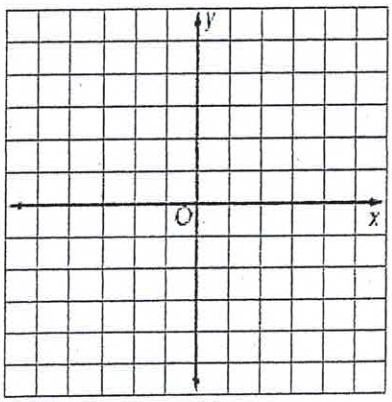
**11.** Line $k$ passes through the point $(8, -3)$ and is parallel to the line $y = 3x - 4$. Write an equation for line $k$.

**12.** Write the equation for the line perpendicular to the given line and through the given point.

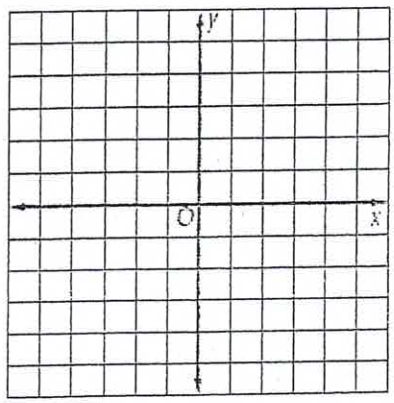
$y = \frac{4}{3}x - 3$ and $(3, -1)$

**13.** Graph each of the following lines.

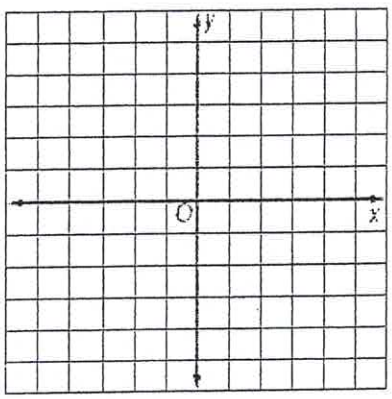
**a.** slope: $-\frac{3}{4}$, through $(-5, -1)$




**b.** slope: $-3$, $x$-intercept: 4




**c.** slope: 0; y-intercept: $-2$

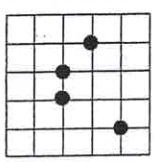



**14.** State whether each set is a function. Find the domain and range.

a. {(2, 5), (5, 6), (2, -6), (3, 8)} _____ Domain: _____ Range: _____

b. {(1, -2), (8, -4), (-3, 8), (-1, 2)} _____ Domain: _____ Range: _____

**15.** Determine whether each graph is the graph of a function.



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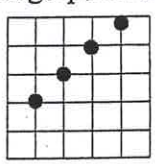

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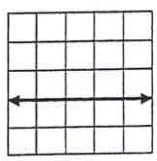

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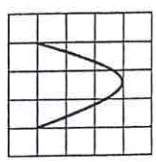

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16. Use $f(x) = x^2 - 3$ and $g(x) = 4x - 1$ to find each value.

a. $f(-3)$

b. $g(-7)$

c. $f\left(\frac{4}{3}\right)$

d. $f(-5) + 8$

17. The function $g(x) = 1.5x + 160$ models the weight gain of a basketball player as he starts a workout program where $g$ is the weight in pounds after $x$ weeks.

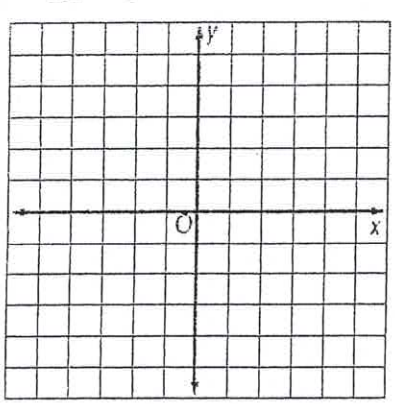
a. Explain the meaning of 160 in the context of this problem.

b. Explain the meaning of 1.5 in the context of this problem.

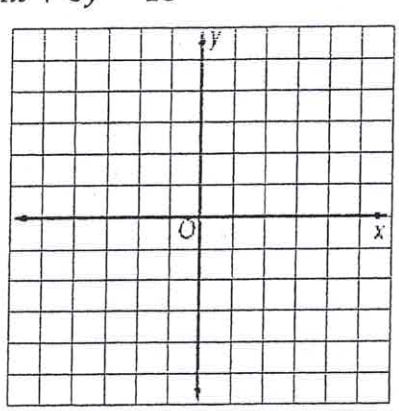
c. Evaluate $g(6)$ and explain its meaning.

18. Solve the following systems of equations by graphing.

a. $y = -\frac{1}{2}x + 4$
$y = 2x - 6$




b. $y = -\frac{2}{3}x + 3$
$4x + 6y = 18$




19. Solve the following systems by substitution:

**a.** $a = -4b - 4$
$3a - 5b = 22$

**b.** $6x - 7y = 23$
$y = -2x + 11$

**c.** $9y + 3x = 18$
$3y + x = -6$

**20.** Solve the following systems by elimination:

**a.** $5x + 7y = 2$
$2x - 7y = -9$

**b.** $x - 6y = 44$
$8x + 12y = 0$

**c.** $-5x + 11y = 35$
$6x + 8y = 62$

**21.** Use the laws of exponents to simplify each expression. (Negative exponents should be simplified)

a. $3a^4b(-5a^7b^3)$

b. $(3y^2z^2)(-5yz^4)$

c. $x^0$

d. $(2c^{-3})^2(4c^2)$

e. $\frac{22x^3y^6}{14x^{13}y^{-3}}$

f. $(3x^4y)^3$

g. $\frac{(3x^{-2})^2}{3x^6}$

**22.** Simplify the radicals – answer in simplified radical form (not decimal!).

a. $\sqrt{40}$

b. $\frac{3\sqrt{8}}{\sqrt{3}}$

c. $-3\sqrt{98}$

d. $\sqrt{18}\cdot\sqrt{32}$

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## MATHEMATICS TEST

*60 Minutes—60 Questions*

**DIRECTIONS:** Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

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DO YOUR FIGURING HERE.

1. On level ground, a vertical rod 12 feet tall casts a shadow 4 feet long, and at the same time a nearby vertical flagpole casts a shadow 12 feet long. How many feet tall is the flagpole?

   A. 4
   B. 8
   C. 12
   D. 20
   E. 36

2. Kalino earned 85, 95, 93, and 80 points on the 4 tests, each worth 100 points, given so far this term. How many points must he earn on his fifth test, also worth 100 points, to average 90 points for the 5 tests given this term?

   F. 87
   G. 88
   H. 90
   J. 92
   K. 97

3. If $x = -5$, what is the value of $\frac{x^2-1}{x+1}$ ?

   A. $-6$
   B. $-4$
   C. 4
   D. $5\frac{4}{5}$
   E. 19

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

4. Kaya ran $1\frac{2}{5}$ miles on Monday and $2\frac{1}{3}$ miles on Tuesday. What was the total distance, in miles, Kaya ran during those 2 days?

F. $3\frac{2}{15}$

G. $3\frac{3}{8}$

H. $3\frac{2}{5}$

J. $3\frac{7}{15}$

K. $3\frac{11}{15}$

5. Consider the 3 statements below to be true.

All insects that are attracted to honey are ants.
Insect I is not an ant.
Insect J is attracted to honey.

Which of the following statements is necessarily true?

A. Insect I is an ant not attracted to honey.
B. Insect I is an ant attracted to honey.
C. Insect I is attracted to honey.
D. Insect J is not attracted to honey.
E. Insect J is an ant.

6. What is the value of the expression $\sqrt{\frac{m}{x-3}}$ when $x=-1$ and $m=-16$ ?

F. $-2$

G. $2$

H. $2\sqrt{2}$

J. $2i$

K. $2i\sqrt{2}$

7. Tickets for a community theater production cost \$6 each when bought in advance and \$8 each when bought at the door. The theater group's goal is at least \$2,000 in ticket sales for opening night. The theater group sold 142 opening-night tickets in advance. What is the minimum number of tickets they need to sell at the door on opening night to make their goal?

A. 143
B. 144
C. 192
D. 250
E. 357

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DO YOUR FIGURING HERE.

8. Mark and Juanita own a sandwich shop. They offer 3 kinds of bread, 5 kinds of meat, and 3 kinds of cheese. Each type of sandwich has a combination of exactly 3 ingredients: 1 bread, 1 meat, and 1 cheese. How many types of sandwiches are possible?

F. 11
G. 15
H. 30
J. 45
K. 120

9. If $12(x - 11) = -15$, then $x = ?$

A. $-\frac{49}{4}$

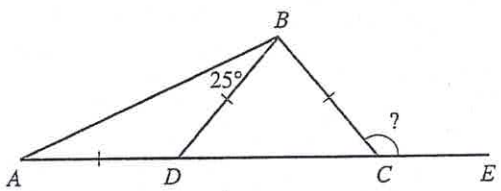
B. $-\frac{13}{6}$

C. $-\frac{5}{4}$

D. $-\frac{1}{3}$

E. $\frac{39}{4}$

10. In the figure below, $A$, $D$, $C$, and $E$ are collinear. $\overline{AD}$, $\overline{BD}$, and $\overline{BC}$ are all the same length, and the angle measure of $\angle ABD$ is as marked. What is the degree measure of $\angle BCE$ ?




F. 50°
G. 100°
H. 105°
J. 130°
K. 160°

11. If $f(x) = 9x^2 + 5x - 8$, then $f(-2) = ?$

A. −54
B. −18
C. 18
D. 36
E. 38

12. What is the least common multiple of 30, 20, and 70 ?

F. 40
G. 42
H. 120
J. 420
K. 42,000

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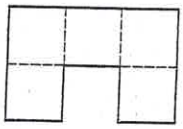
DO YOUR FIGURING HERE.

13. While doing a problem on his calculator, Tom meant to divide a number by 2, but instead he accidentally multiplied the number by 2. Which of the following calculations could Tom then do to the result on the calculator screen to obtain the result he originally wanted?

A. Subtract the original number
B. Multiply by 2
C. Multiply by 4
D. Divide by 2
E. Divide by 4

14. The 8-sided figure below is divided into 5 congruent squares. The total area of the 5 squares is 125 square inches. What is the perimeter, in inches, of the figure?

F. 25
G. 60
H. 80
J. 100
K. 125



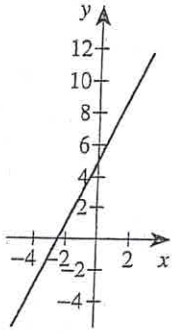
15. Hai has $100 available to buy USB drives to back up data for his business computers. Each USB drive has a price of $8, and Hai will pay a sales tax of 7% of the total price of the USB drives. What is the maximum number of USB drives Hai can buy?

A. 11
B. 12
C. 13
D. 14
E. 15

16. A certain computer performs $1.5 \times 10^8$ calculations per second. How many seconds would it take this computer to perform $6.0 \times 10^{16}$ calculations?

F. $2.5 \times 10^{-9}$
G. $9.0 \times 10^{0}$
H. $4.0 \times 10^{2}$
J. $4.0 \times 10^{8}$
K. $9.0 \times 10^{24}$

17. One of the following is an equation of the linear relation shown in the standard $(x,y)$ coordinate plane below. Which equation is it?




A. $y = 5x$
B. $y = 2x$
C. $y = 5x + 2$
D. $y = 2x - 5$
E. $y = 2x + 5$

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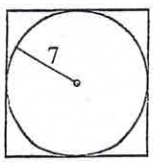
DO YOUR FIGURING HERE.

18. A square is circumscribed about a circle of 7-foot radius, as shown below. What is the area of the square, in square feet?

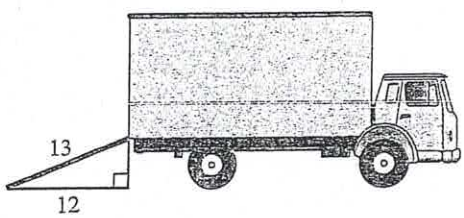



F. 49
G. 56
H. 98
J. $49\pi$
K. 196

19. Two workers were hired to begin work at the same time. Worker A's contract called for a starting salary of \$20,000 with an increase of \$800 after each year of employment. Worker B's contract called for a starting salary of \$15,200 with an increase of \$2,000 after each year of employment. If $x$ represents the number of full years' employment (that is, the number of yearly increases each worker has received), which of the following equations could be solved to determine the number of years until B's yearly salary equals A's yearly salary?

A. $20{,}000 + 800x = 15{,}200 + 2{,}000x$
B. $20{,}000 + 2{,}000x = 15{,}200 + 800x$
C. $(20{,}000 + 800)x = (15{,}200 + 2{,}000)x$
D. $(2{,}000 + 800)x = 20{,}000 - 15{,}200$
E. $(2{,}000 - 800)x = 20{,}000 + 15{,}200$

20. A ramp for loading trucks is 13 feet long and covers 12 feet along the level ground, as shown below. How many feet high is the highest point on the ramp?




F. 1
G. 2
H. 4
J. 5
K. $6\frac{1}{4}$

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21. The expression $7(x + 3) - 3(2x - 2)$ is equivalent to:

DO YOUR FIGURING HERE.

A. $x + 1$
B. $x + 15$
C. $x + 19$
D. $x + 23$
E. $x + 27$

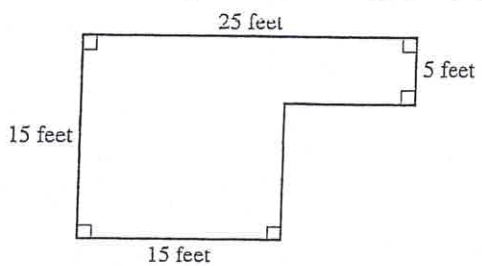
22. If 115% of a number is 460, what is 75% of the number?

F. 280
G. 300
H. 320
J. 345
K. 400

23. When $(2x - 3)^2$ is written in the form $ax^2 + bx + c$, where $a$, $b$, and $c$ are integers, $a + b + c = ?$

A. −17
B. −5
C. 1
D. 13
E. 25

24. What is the area, in square feet, of the figure below?




F. 60
G. 80
H. 275
J. 375
K. 450

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DO YOUR FIGURING HERE.

25. Barb is going to cover a rectangular area 8 feet by 10 feet with rectangular paving blocks that are 4 inches by 8 inches by 2 inches to make a flat patio. What is the minimum number of paving blocks she will need if all the paving blocks will face the same direction?

(Note: Barb will not cut any of the paving blocks.)

A. 80
B. 360
C. 601
D. 960
E. 1,213

26. What is the slope of the line represented by the equation $6y - 14x = 5$ ?

F. $-14$

G. $\frac{5}{6}$

H. $\frac{7}{3}$

J. 6

K. 14

27. Let $m$ and $n$ be 2 positive integers, such that $m < n$. Which of the following compound inequalities *must* be true?

A. $0 < \sqrt{mn} < m$
B. $1 < \sqrt{mn} < m$
C. $m < \sqrt{mn} < n$
D. $\sqrt{m} < \sqrt{mn} < \sqrt{n}$
E. $\sqrt{m-n} < \sqrt{mn} < \sqrt{m+n}$

28. Two similar triangles have perimeters in the ratio 3:5. The sides of the smaller triangle measure 3 cm, 5 cm, and 7 cm, respectively. What is the perimeter, in centimeters, of the larger triangle?

F. 15
G. 18
H. 20
J. 25
K. 36

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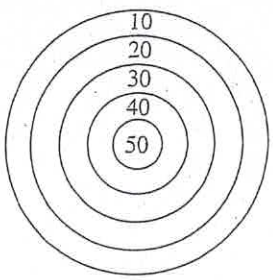
DO YOUR FIGURING HERE.

29. Thomas and Jonelle are playing darts in their garage using the board with the point values for each region shown below. The radius of the outside circle is 10 inches, and each of the other circles has a radius 2 inches smaller than the next larger circle. All of the circles have the same center. Thomas has only 1 dart left to throw and needs at least 30 points to win the game. Assuming that his last dart hits at a random point within a single region on the board, what is the percent chance that Thomas will win the game?




A. 36%
B. 30%
C. 16%
D. 9%
E. $1\frac{1}{2}\%$

30. When asked his age, the algebra teacher said, "If you square my age, then subtract 23 times my age, the result is 50." How old is he?

F. 23
G. 25
H. 27
J. 46
K. 50

31. The distance, $d$, an accelerating object travels in $t$ seconds can be modeled by the equation $d = \frac{1}{2}at^2$, where $a$ is the acceleration rate, in meters per second per second. If a car accelerates from a stop at the rate of 20 meters per second per second and travels a distance of 80 meters, about how many seconds did the car travel?

A. Between 1 and 2
B. Between 2 and 3
C. Between 3 and 4
D. 4
E. 8

32. Which of the following is the set of all real numbers $x$ such that $x + 3 > x + 5$ ?

F. The empty set
G. The set containing all real numbers
H. The set containing all negative real numbers
J. The set containing all nonnegative real numbers
K. The set containing only zero



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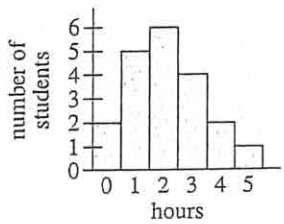
DO YOUR FIGURING HERE.

Use the following information to answer questions 33–35.

A survey in a study skills class asked the 20 students enrolled in the class how many hours (rounded to the nearest hour) they had spent studying on the previous evening. The 20 responses are summarized by the histogram below.




33. What fraction of the students responded that they had spent less than 3 hours studying?

A. $\frac{13}{100}$

B. $\frac{1}{5}$

C. $\frac{3}{10}$

D. $\frac{13}{20}$

E. $\frac{17}{20}$

34. The teacher decides to show the data in a circle graph (pie chart). What should be the measure of the central angle of the sector for 3 hours?

F. 18°
G. 20°
H. 36°
J. 72°
K. 90°

35. To the nearest tenth of an hour, what is the average number of hours for the 20 survey responses?

A. 2.0
B. 2.1
C. 2.3
D. 2.5
E. 3.0

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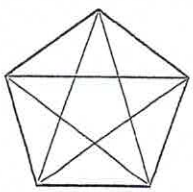
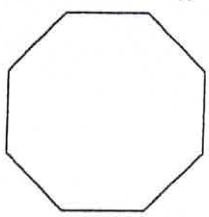
36. Pentagons have 5 diagonals, as illustrated below.

DO YOUR FIGURING HERE.



How many diagonals does the octagon below have?



F. 8
G. 16
H. 20
J. 30
K. 40

37. The bottom of the basket of a hot-air balloon is parallel to the level ground. One taut tether line 144 feet long is attached to the center of the bottom of the basket and is anchored to the ground at an angle of 72°, as shown in the figure below. Which of the following expressions gives the distance, in feet, from the center of the bottom of the basket to the ground?

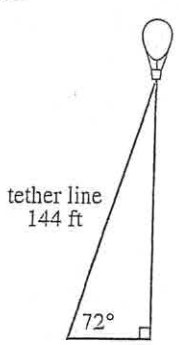
A. $\frac{144}{\cos 72°}$

B. $\frac{144}{\sin 72°}$

C. $144 \tan 72°$

D. $144 \cos 72°$

E. $144 \sin 72°$




38. The coordinates of the endpoints of $\overline{GH}$, in the standard $(x,y)$ coordinate plane, are $(-8,-3)$ and $(2,3)$. What is the $x$-coordinate of the midpoint of $\overline{GH}$ ?

F. −6
G. −3
H. 0
J. 3
K. 5

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DO YOUR FIGURING HERE.

39. Let $2x + 3y = 4$ and $5x + 6y = 7$. What is the value of $8x + 9y$ ?

A. $-10$
B. $-1$
C. $2$
D. $7$
E. $10$

40. What are the values of $\theta$, between 0 and $2\pi$, when $\tan\theta = -1$ ?

F. $\frac{\pi}{4}$ and $\frac{3\pi}{4}$ only

G. $\frac{3\pi}{4}$ and $\frac{5\pi}{4}$ only

H. $\frac{3\pi}{4}$ and $\frac{7\pi}{4}$ only

J. $\frac{5\pi}{4}$ and $\frac{7\pi}{4}$ only

K. $\frac{\pi}{4}$, $\frac{3\pi}{4}$, $\frac{5\pi}{4}$, and $\frac{7\pi}{4}$

41. For the complex number $i$ and an integer $x$, which of the following is a possible value of $i^x$ ?

A. 0
B. 1
C. 2
D. 3
E. 4

42. A can of soda pop has the shape of a right circular cylinder with an inside height of 6 inches and an inside diameter of 2 inches. When you pour the soda pop from the full can into a cylindrical glass with an inside diameter of 3 inches, about how many inches high is the soda pop in the glass?

(Note: The volume of a right circular cylinder is $\pi r^2 h$.)

F. $2\frac{2}{3}$

G. 4

H. 5

J. $6\frac{2}{3}$

K. 8

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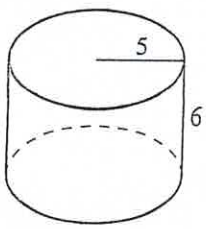
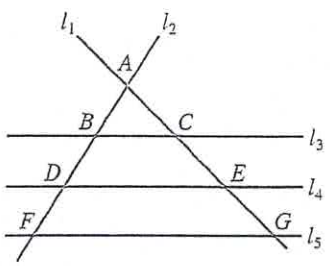
DO YOUR FIGURING HERE.

43. The height and radius of the right circular cylinder below are given in meters. What is the volume, in cubic meters, of the cylinder?



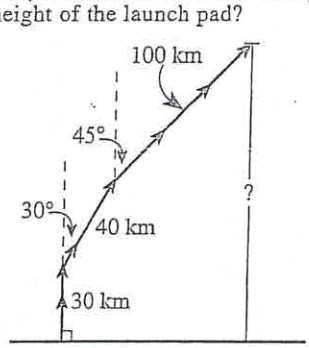

A. $30\pi$
B. $31\pi$
C. $150\pi$
D. $180\pi$
E. $900\pi$

44. Lines $l_1$ and $l_2$ intersect each other and 3 parallel lines, $l_3$, $l_4$, and $l_5$, at the points shown in the figure below. The ratio of the perimeter of $\triangle ABC$ to the perimeter of $\triangle AFG$ is 1:3. The ratio of $DE$ to $FG$ is 2:3. What is the ratio of $AC$ to $CE$ ?




F. 1:1
G. 1:2
H. 1:3
J. 2:1
K. 3:1

45. A rocket lifted off from a launch pad and traveled vertically 30 kilometers, then traveled 40 kilometers at 30° from the vertical, and then traveled 100 kilometers at 45° from the vertical, as shown in the figure below. At that point, the rocket was how many kilometers above the height of the launch pad?




A. 100
B. 170
C. 190
D. $20\sqrt{3} + 50\sqrt{2}$
E. $30 + 20\sqrt{3} + 50\sqrt{2}$

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DO YOUR FIGURING HERE.

46. Machine A produces 500 springs a day. The number of *defective* springs produced by this machine each day is recorded for 60 days. Based on the distribution given below, what is the expected value of the number of *defective* springs produced by Machine A in any single day?

| Number, $n$, of defective springs produced | Probability that $n$ defective springs are produced in any single day |
|---|---|
| 0 | 0.70 |
| 1 | 0.20 |
| 2 | 0.05 |
| 3 | 0.05 |

F. 0.00
G. 0.45
H. 0.70
J. 1.00
K. 1.50

47. The height above the ground, $h$ units, of an object $t$ seconds after being thrown from the top of a building is given by the equation $h = -2t^2 + 10t + 48$. An equivalent factored form of this equation shows that the object:

A. starts at a point 2 units off the ground.
B. reaches a maximum height of 3 units.
C. reaches a maximum height of 8 units.
D. reaches the ground at 3 seconds.
E. reaches the ground at 8 seconds.

48. For all positive values of $g$ and $h$, which of the following expressions is equivalent to $g^2\sqrt{g^5} \cdot h^2\sqrt[4]{h^5}$ ?

F. $g^2h^2\sqrt[5]{g^2h^2}$
G. $g^3h\sqrt[4]{g^2h^3}$
H. $g^4h^3\sqrt[4]{g^2h}$
J. $g^4h^4\sqrt{gh}$
K. $g^7h^7$

49. The value of $\log_5\left(5^{\frac{13}{2}}\right)$ is between which of the following pairs of consecutive integers?

A. 0 and 1
B. 4 and 5
C. 5 and 6
D. 6 and 7
E. 9 and 10

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DO YOUR FIGURING HERE.

Use the following information to answer questions 50–52.

A storage facility is currently offering a special rate to customers who sign contracts for 6 months or more. According to this special rate, the first month's rent is $1, and for each month after the first month, customers pay the regular monthly rental rate. The table below shows the storage unit sizes available, the floor dimensions, and the regular monthly rental rate. All the units have the same height.

| Size | Floor dimensions, in meters | Regular monthly rental rate |
|---|---|---|
| 1 | 2 × 4 | $ 30 |
| 2 | 4 × 4 | $ 60 |
| 3 | 4 × 8 | $100 |
| 4 | 8 × 8 | $150 |
| 5 | 8 × 16 | $200 |

50. Daria will sign a contract to rent a Size 3 unit for 12 months at the current special rate. The amount Daria will pay for 12 months at the current special rate represents what percent decrease from the regular rental rate for 12 months?

F. 8.25%
G. 8.33%
H. 8.42%
J. 9.00%
K. 9.09%

51. Size 5 units can be subdivided to form other sizes of units. What is the greatest number of Size 1 units that can be formed from a single Size 5 unit?

A. 2
B. 4
C. 8
D. 10
E. 16

52. Janelle, the owner of the storage facility, is considering building new units that have floor dimensions larger than Size 5 units. She will use the floor area to determine the heating requirements of these larger units. For this calculation, Janelle will use the same relationship between the unit size number and the respective floor area for Sizes 1 through 5. Which of the following expressions gives the floor area, in square meters, of a Size $x$ storage unit?

F. $2^3 \cdot x$
G. $2^{3x}$
H. $2^{(2+x)}$
J. $2(x+1)^2$
K. $(x+2)^2$

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