FORM 1163E

2 △ △ △ △ △ △ △ △ △ 2

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.

DO YOUR FIGURING HERE.

1. For each of 3 years, the table below gives the number of games a football team played, the number of running plays they ran, and the total number of yards the team gained on running plays.

Year	Games	Running plays	Total yards gained on running plays
1997	11	397	1,028
1998	11	394	1,417
1999	9	378	1,920

To the nearest tenth of a yard, what is the average number of yards gained per running play in 1998?

A. 2.6
B. 2.7
→ C. 3.6
D. 4.9
E. 5.1

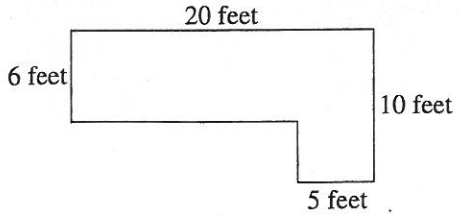
$\frac{1417}{394} = 3.5964$

≈ 3.6

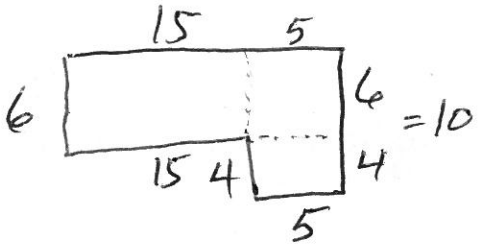
$\frac{\text{TOTAL YARDS GAINED}}{\text{\# OF RUNNING PLAYS}} = \text{AVERAGE YARDS GAINED PER PLAY}$

---

2. For the polygon below, the lengths of 2 sides are not given. Each angle between adjacent sides measures 90°. What is the polygon's perimeter, in feet?



F. 41
G. 52
→ H. 60
J. 140
K. 200



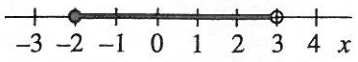
ANSWER QUESTION ASKED. IT ASKS FOR PERIMETER, NOT AREA.

$6+20+10+5+4+15=$

60

DO YOUR FIGURING HERE.

3. Which of the following inequalities represents the graph shown below on the real number line?



A. $-2 \leq x \leq 2$
→ B. $-2 \leq x < 3$
C. $0 \leq x < 3$
D. $2 \leq x \leq 3$
E. $3 < x \leq -2$

INEqualities
think "where is x?
x is less than 3 and greater than or equal to -2. B says it ALL.

EXPONENTS

4. What is the value of $3 \cdot 2^{x+y}$ when $x = 4$ and $y = -1$?

F. 216
G. 96
H. 47
→ J. 24
K. 18

Plug in Numbers and simplify

$3 \cdot 2^{4+(-1)} = 3 \cdot 2^3 = 3 \cdot 8 = 24$

INTEGERS are the whole Numbers that are + or −.

5. For integers a and b such that $ab = 8$, which of the following is NOT a possible value of a ?

A. 2
B. 1
C. −4
→ D. −6
E. −8

b is an INTEGER
solve for b and see where a does NOT produce an INTEGER for b. $b = \frac{8}{a}$

Volume of cube $= s^3$

6. What is the volume, in cubic centimeters, of a cube whose edges each measure 4 centimeters in length?

F. 12
G. 16
H. 24
→ J. 64
K. 96

$s^3 = 4^3 = 4 * 4 * 4 = 16 * 4 = 64$

USING Algebra to find TOTALS

7. A community center sponsored a 1-day craft show. The center offered 2 sizes of display tables for rent and charged $40 to rent one of the 70 large tables and $25 to rent one of the 50 small tables. Which of the following expressions gives the total amount of money, in dollars, collected from renting all of the small tables and L of the large tables?

A. $L + 50$
→ B. $40L + 1,250$
C. $40L + 2,000$
D. $65L$
E. $4,050L$

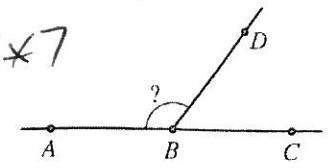
they have already rented all the 50 SMALL TABLES so they have collected $50 * \$25 = \$1250$
the only ANSWER that has $1250 in it is B.

8. In the figure below, A, B, and C are collinear, the measure of $\angle ABD$ is $7x°$, and the measure of $\angle CBD$ is $3x°$. What is the measure of $\angle ABD$?

DO YOUR FIGURING HERE.

Supplemental Angles
Total 180°
$7x° + 3x° = 180°$ $x = 18°$

F. 252°
G. 126° $= 18 \times 7$
H. 108°
J. 54°
K. 18°



9. Which of the following is NOT a possible value for a probability?

Probability

A. 0.001
B. 0.5
C. $\frac{6}{10}$
D. $\frac{3}{8}$
E. $\frac{34}{31}$

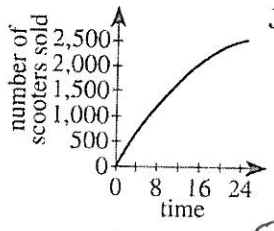
greater than 1

All values of chance are between 0 and 1

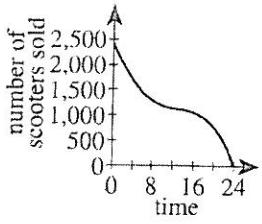
10. For the first several months after the Fiery Red Scooter arrived in toy stores, the rate of sales increased slowly. As this new scooter caught on, however, the rate of sales increased rapidly. After several more months, many people owned a Fiery Red Scooter, and the rate of sales decreased. Which of the following graphs could represent the total number of Fiery Red Scooters sold as a function of time, in months, after the scooter arrived in toy stores?

Translating real life events into graphical form

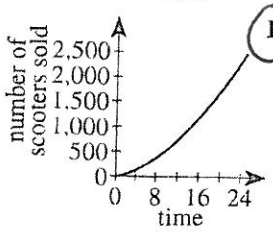
F.



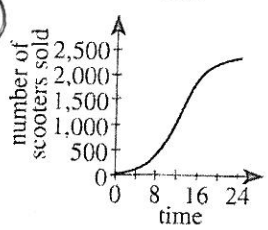
J.



G.

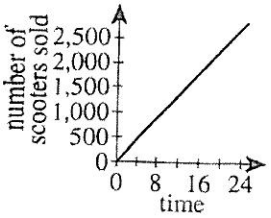


K.



← slow, rapid increase, decrease in rate of increase.

H.



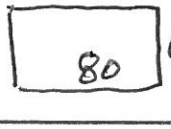
11. For a community service project, members of the junior class at San Carlos High School are going to varnish the rectangular dining room floor of a local nursing home. The floor is 60 feet wide and 80 feet long. Under the assumption that 1 can of varnish covers exactly 250 square feet, what is the minimum number of cans of varnish they will need in order to put 1 coat of varnish on this floor?

A. 1
B. 9
C. 10
D. 19
→ E. 20

DO YOUR FIGURING HERE.

AREA and DIVISION

4800 divided by 250 = 19.2. If you only bought 19 cans, you'd miss a spot.



$A = 80 \times 60$
$= 4800$

---

12. Carl is making a scale drawing of his rectangular bedroom floor. The floor is 12 feet wide by 14 feet long. He is using a scale of $\frac{1}{4}$ inch = 1 foot for the scale drawing of the floor. What will be the dimensions, in inches, of Carl's bedroom floor in the scale drawing?

→ F. 3 by $3\frac{1}{2}$
G. 4 by $4\frac{2}{3}$
H. 6 by 7
J. 36 by 42
K. 48 by 56

Scale Drawings

Use proportions, but Make sure all your Measurements are CONSISTENT.

$\frac{\frac{1}{4}}{1 \text{ foot}} = \frac{?}{12 \text{ feet}} \Rightarrow 12\left(\frac{1}{4}\right) = 1\,? \quad 3 = ?$

The only ANSWER with 3 is F

---

13. According to a recent survey of students about the juice they each preferred, 20% of the students preferred cranberry juice, 40% preferred orange juice, 20% preferred grapefruit juice, and the remaining students preferred tomato juice. If each student preferred only 1 juice and 250 students preferred tomato juice, how many students were surveyed?

A. 330
B. 500
C. 625
D. 1,000
→ E. 1,250

PERCENT and TOTALS

If they all Preferred one, then Tomato is 20% of TOTAL because they ALL have to add up to 100%.

20% cran + 40% OJ + 20% G + 20% T = 100%

If 20% of TOTAL = 250, then

$0.20t = 250$

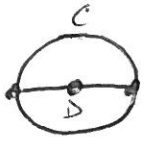
---

14. The circumference of each tire on a bicycle is 50 inches. About how many revolutions does one of these bicycle tires make traveling 300 feet (3,600 inches) without slipping?

F. 6
G. 18
→ H. 72
J. 300
K. 864

Circumference is distance around a circle. If you took the distance around the circle and stretch it out, it would be a straight line.

3600 inches broken up into 50 inch increments would TOTAL 72 increments



$\pi = \frac{C}{D} \quad C = D\pi \quad C = 2\pi r$

2 Simplifying Algebraic Polynomials 2

15. $(4x^2 - 3x + 7) - (-1 + 5x + 2x^2)$ is equivalent to:

DO YOUR FIGURING HERE.

→ **A.** $2x^2 - 8x + 8$
B. $2x^2 + 2x + 8$
C. $2x^4 + 2x^2 + 6$
D. $6x^2 - 8x + 6$
E. $6x^4 - 8x^2 + 6$

$4x^2 - 3x + 7 + 1 - 5x - 2x^2$

$2x^2 - 8x + 8$

Make sure you distribute the Negative properly.

---

16. A ticket for a movie at the Hazelnut Cinema costs $5.00. Latoya treats her younger brother to a movie at the Hazelnut Cinema. She gives him $\frac{1}{2}$ the money she brought with her, for his ticket and a snack. When he asks to play a video game, she gives him $1.00. That leaves Latoya exactly enough money to buy her own ticket. How much money did Latoya bring with her?

x = Money @ start

Let x be the amount of money Latoya began with. Set up Algebra problem to solve for the answer.

F. $10.00
G. $11.00
→ **H.** $12.00
J. $13.00
K. $14.00

$\frac{1}{2}x - \$1 = \$5$

$\frac{1}{2}x = 6$ so $x = \$12$

Don't let "snack" confuse you.

---

17. Mr. Gomez gave his class a test on 20 spelling words. Only one of the following percents is possible as the percent of the 20 words a student spelled correctly. Which one is it?

Calculator Appropriate

Percent is fraction of a whole.

→ **A.** 77%
B. 85%
C. 88%
D. 96%
E. 99%

$\frac{\text{Correct Answers}}{\text{Total Questions}} = \%\text{ correct}$

I went 19/20, 18/20 and 17/20 until I found a match

---

18. The first 5 terms of a geometric sequence are 0.375, −1.5, 6, −24, and 96. What is the 6th term?

Geometric Sequences have common ratio. Find common Ratio and apply it to find next Term.

→ **F.** −384
G. −126
H. −66
J. 126
K. 384

$\frac{-24}{6} = -4$ −4 is common Ratio $96 * -4 = -384$

---

19. $(2x - 3y)^2$ is equivalent to:

Binomial Squared

→ **A.** $4x^2 - 12xy + 9y^2$
B. $4x^2 - 10xy + 9y^2$
C. $4x^2 - 9y^2$
D. $4x^2 + 9y^2$
E. $4x - 6y$

Take 1st Term & Square it $(2x)^2 = 4x^2$

Take 2nd Term and Square it $(-3y)^2 = 9y^2$

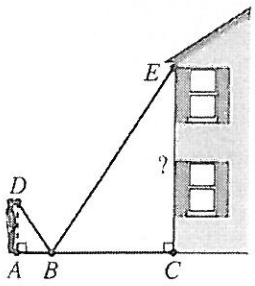
$(a-b)^2 = a^2 - 2ab + b^2$

Take both terms and multiply them and the double the Product

$2x * -3y = -6xy * 2 = -12xy$

20. As shown in the figure below, Mr. Thompson, who is standing at point A, needs to determine the distance from point C on the ground to point E at the top of one of the second-story windows of his house. He places a mirror on the ground at point B so that when he looks in the mirror, he can see the top of the window. Mr. Thompson's eye level, at point D, is 6 ft above the ground. He notes that $AB = 4$ ft and $BC = 14$ ft. Approximately how many feet above the ground is the top of the second-story window?

(Note: In $\triangle ABD$ and $\triangle CBE$, $\angle ABD$ is congruent to $\angle CBE$.)

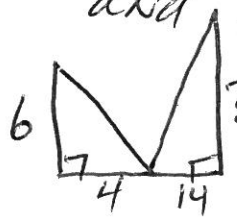


F. 2
G. 10
→ H. 16
J. 21
K. 24

DO YOUR FIGURING HERE.

Similar Triangles are Equal in proportion

Label diagram with #'s then set up proportion and solve for ?



$\frac{6}{4} \Rightarrow \frac{3}{2} = \frac{?}{14}$

$? = \frac{14 * 3}{2} = 7 * 3 = 21$

21. What is the solution to the equation $7x - (x - 3) = 6$?

A. $-\frac{3}{2}$
B. -2
→ C. $\frac{1}{2}$
D. $\frac{3}{2}$
E. 2

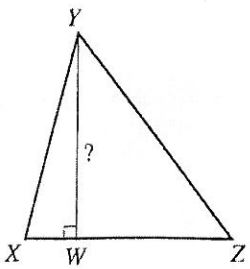
Solving for x

Again, Make sure you distribute the Negative properly.

$7x - x + 3 = 6$

$6x = 3 \longrightarrow x = \frac{1}{2}$

22. The area of $\triangle XYZ$ below is 32 square inches. If $\overline{XZ}$ is 8 inches long, how long is altitude $\overline{YW}$, in inches?



F. 10
→ G. 8
H. 6
J. 4
K. 2

Area of $\triangle = \frac{bh}{2}$

Altitude is height

$\overline{XZ}$ = Base = 8

Don't know height/altitude

$A = \frac{bh}{2}$

$32 = \frac{8 * h}{2} \Rightarrow 32 = 4h$

$h = 8$

Functions

2 Plug and chug △ △ △ △ 2

DO YOUR FIGURING HERE.

23. Given $f(x) = 2x^2 - 5x + 7$, what is the value of $f(-10)$?

A. −243
B. −143
C. 157
→ D. 257
E. 457

$f(-10) = 2(-10)^2 - 5(-10) + 7$
$200 - (-50) + 7$
$250 + 7 = 257$

---

calculator appropriate

24. The cheerleading squad wants to purchase new uniforms to wear at the regional championship competition. They decide to sell candy bars for $1.00 each. The squad will receive $0.40 for each of the first 200 candy bars sold. For each of the next 300 sold, the squad will receive $0.50. For each additional candy bar sold, the squad will receive $0.60. How many candy bars must the squad sell to reach their goal of raising $350.00 ?

F. 350
G. 584
H. 667
→ J. 700
K. 875

Adding with VARYING factors.

$200 * 0.40 = 80$
$300 * 0.50 = 150$
For the 1st 500 they'll make $230

$\$350 - 230 = \$120$
$\$\ 0.60x = \$120$
$x = 200$
$500 + 200 = 700$

---

25. The table below shows the age distribution of the student body at Memorial High School.

Age, in years	14	15	16	17	18
Percent of students	6%	28%	26%	31%	9%

What percent of the students are at least 16 years old?

A. 34%
B. 40%
C. 50%
D. 60%
→ E. 66%

Needs to TOTAL 100%

Variation of inequality

They are looking for the amount in percent of students who are greater than or equal to 16 ⇒ $26 + 31 + 9 = 66$

---

26. What percent of $\frac{2}{3}$ is $\frac{1}{3}$?

F. 22%
G. 33%
→ H. 50%
J. 67%
K. 200%

Translating to solve for unknown.

$\frac{x}{100} * \frac{2}{3} = \frac{1}{3}$
$\frac{x}{100} = \frac{1}{3} * \frac{3}{2} = \frac{1}{2}$

or you can think $\frac{2}{3} = \frac{1}{3} + \frac{1}{3}$ so one 1/3 is half of $\frac{2}{3}$

---

27. The sign below advertises a sale on coats. What is the sale price of a coat with a regular price of $84.00 ?

SALE SALE SALE
All Coats
3/4 off the regular price!
SALE SALE SALE

A. $ 9.00
→ B. $21.00
C. $42.00
D. $63.00
E. $83.25

$\frac{1}{4}$ or 0.25 of $84 = 21$

PERCENT or fraction of A TOTAL

Question asks Sale Price

The Sale price is $\frac{3}{4}$ off not $\frac{3}{4}$ of

If it's $\frac{3}{4}$ off then you are only PAYING $\frac{1}{4}$ of Full Price

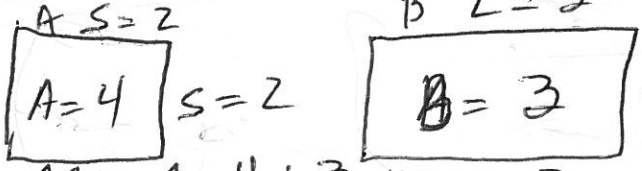
$\frac{1}{4}$ of $84 = 21$

2 Ratio △ △ △ △ △ △ 2

28. The ratio of a side of square A to the length of rectangle B is 2:3. The ratio of a side of square A to the width of rectangle B is 2:1. What is the ratio of the area of square A to the area of rectangle B ?

F. 2:1
G. 3:1
H. 3:2
J. 4:1
→ K. 4:3

Diagram Helpful



AREA A 4 : 3 Area B

As long as S was 2 in both ratios, you can do this.

---

29. In Intermediate Algebra class, Ms. Schimmack makes the statement "y varies directly as the product of w^2 and x, and inversely as z^3" and asks her students to translate it into an equation. Which of the following equations, with k as the constant of proportionality, is a correct translation of Ms. Schimmack's statement?

→ A. $y = \frac{kw^2x}{z^3}$
B. $y = \frac{kz^3}{w^2x}$
C. $y = \frac{w^2xz^3}{k}$
D. $y = \frac{z^3}{kw^2x}$
E. $y = kw^2xz^3$

Direct and INVERSE VARIATION

Direct / Straight	INVERSE / curve
$y = kx$ Like slope	$y = \frac{k}{x}$

K = CONSTANT OF VARIATION

1) Varies directly to product of w^2 and x = $y = w^2x$

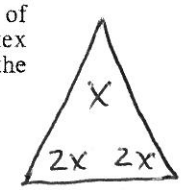
y varies inversely as z^3 means $y = \frac{1}{z^3}$

---

30. In a certain isosceles triangle, the measure of each of the base angles is twice the measure of the vertex angle. What is the measure, in degrees, of each of the base angles?

F. 36°
G. 60°
→ H. 72°
J. 120°
K. 144°

Isoseles TRIANGLES



$X + 2x + 2x = 5x$

$5x = 180°$

$x = 36°$

$2x = 72°$

---

31. For a single production run, when n items are made and sold, a company's profit, P dollars, can be modeled by $P = n^2 - 300n - 100{,}000$. What is the smallest number of items that must be made and sold in order for the company not to lose money on the production run?

A. 150
B. 200
C. 300
D. 350
→ E. 500

Company NEEDS to make at least $100,000 in order to cover its fixed and/or START UP COSTS

Set up inequality so that revenue from sales is greater than $100,000

$n^2 - 300n \geq \$100{,}000$

$n(n-300) \geq 100{,}000$

Choices A B and C obviously won't work Dis less than 100,000

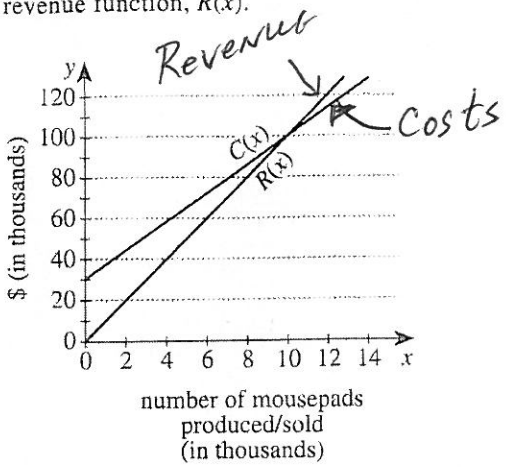
E is the only one

DO YOUR FIGURING HERE.

Linear means STRAight LiNE

Use the following information to answer questions 32–34.

Mousepads Galore is a company that produces computer mousepads. *Cost* is the total money spent to produce and sell the mousepads, and *revenue* is the total income generated by the sale of the mousepads. The graph below depicts projections for the linear cost function, $C(x)$, and the linear revenue function, $R(x)$.



where the two lines intersect is where the COMPANY STARTS to recoup their expenses.

32. During the month of April, Mousepads Galore broke even (did not gain or lose any money) when x mousepads were produced and sold. How many mousepads did the company produce and sell during the month of April?

→ **F.** 10,000
G. 12,000
H. 14,000
J. 15,000
K. 30,000

33. The cost function shown in the graph for Mousepads Galore has 2 components: a fixed cost, plus a constant production cost per mousepad. Which of the following is the fixed cost?

A. $ 0
B. $ 1,000
C. $ 10,000
→ **D.** $ 30,000
E. $100,000

Before the COMPANY sold or produced ONE unit, it had $30,000 in START up cost. Look at point (0, 30)

34. Mousepads Galore sells each mousepad at the same price, which is an integer number of dollars. According to the revenue function, what is the price of each of these mousepads?

F. $ 3
G. $ 7
→ **H.** $10
J. $12
K. Cannot be determined from the given information

$10.00 is your best choice This Question is a little misleading because this point where C(x) crosses R(x) isn't exactly $100,000 / 10,000

The Slope of the R(x) unit is the cost per unit.

35. Which of the following is a *complete* factorization of the expression $2x + 2xy + 6x^2y$?

A. $2x(y + 3xy)$
B. $2x + 2xy(1 + 3x)$
C. $2x(1 + y + 4xy)$
D. $1 + y + 3xy$
→ E. $2x(1 + y + 3xy)$

DO YOUR FIGURING HERE.

Factoring Polynomials

2x is the only common factor of each term $2x(1 + y + 3xy)$

36. Which of the following is an equation of the line that passes through the points (1,3) and (−3,−13) in the standard (x,y) coordinate plane?

F. $x + y = 4$
→ G. $4x - y = 1$
H. $5x - y = 2$
J. $6x - 2y = 8$
K. $7x - 2y = 5$

Slope of line given Two points

$$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{(-13-3)}{(-3-1)} = \frac{-16}{-4} = 4$$

Look at your choices and see which one would have slope 4 in $y = mx + b$ form

37. A square has sides that are the same length as the radius of a circle. If the circle has an area of 36π square units, how many units long is the perimeter of the square?

A. 18
→ B. 24
C. 36
D. 72
E. 324

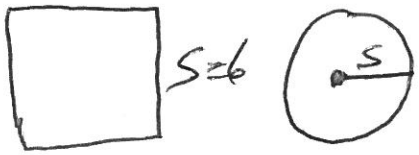
Circumference and Area

Diagrams can help

Area of $\bigcirc = \pi r^2$

$36\pi = \pi s^2$

$6 = s$



Perimeter of square $= 4s = 4(6) = 24$

38. If the following system has a solution, what is the x-coordinate of the solution?

$3x + 6y = 52$
$x + 6y = 24$

F. 19
→ G. 14
H. 6
J. 0
K. The system has no solution.

Systems of Equation

If you want the x value Eliminate the y value

$3x + 6y = 52$
$-\ x + 6y = 24$
$2x = 28$

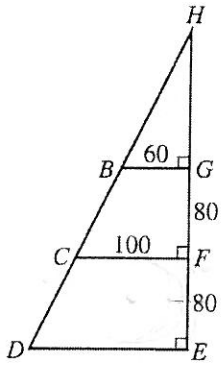
$x = 14$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

Use the following information to answer questions 39–41.

In the figure below, B and C are on $\overline{HD}$ and G and F are on $\overline{HE}$. The measurements given are in inches. Both $BGFC$ and $CFED$ are trapezoids. The area, A, of a trapezoid is given by $A = \frac{1}{2}h(b_1 + b_2)$, where h is the height and b_1 and b_2 are the lengths of the 2 parallel sides.



TRAPEZOID AREA easier to frame as average of bases times the height

$\frac{b_1 + b_2}{2} h$

$\frac{60+100}{2}(40) = 160 \times 40 = 6400$

39. What is the area of $BGFC$, in square inches?

- A. 2,500
- B. 5,400
- → C. 6,400
- D. 7,000
- E. 12,800

Application of given formula

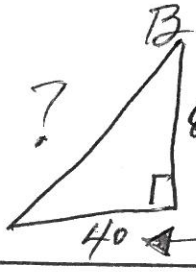
40. What is the length of $\overline{BC}$, in inches?

- F. 90
- G. 100
- H. $\sqrt{4{,}800}$
- → J. $\sqrt{8{,}000}$
- K. $\sqrt{16{,}400}$

Pythagorean theorem

$(80)^2 + (40)^2 = (?)^2$

$\sqrt{8000} = ?$



What's left after you subtract 60 from 100

41. What is the radius, in inches, of the largest circle that can be drawn so that no point of the circle is outside $CFED$?

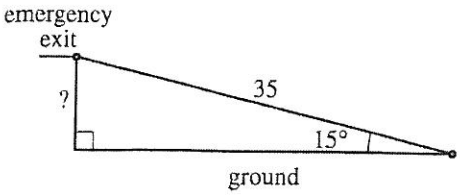
- → A. 40
- B. 50
- C. 60
- D. 70
- E. 80

If NO POINT of circle is outside ▱CFED, then it is TOTALLY inside it Therefore, it has to have radius half the height. Diameter is height

80 ÷ 2 = 40

DO YOUR FIGURING HERE.

42. As shown in the figure below, an escape ramp leading from an emergency exit of an airplane is 35 feet long when fully extended and forms a 15° angle with the level ground.



Given the trigonometric approximations in the table below, what is the height above the ground of the emergency exit, rounded to the nearest 0.1 foot?

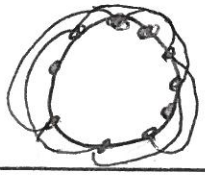
cos 15°	0.966
sin 15°	0.259
tan 15°	0.268

F. 2.8
G. 7.4
H. 7.7
→ **J. 9.1**
K. 9.4

EASY TRIG
SOH CAH TOA
$\sin 15° = \frac{?}{35}$
$0.259 = \frac{?}{35}$
$9.065 = (0.259)35 = ? \approx 9.1$
← To the Nearest 0.1 foot

43. There are 10 equally spaced dots marked on a circle. Kim chooses an integer, n, that is greater than 1. Beginning at a randomly chosen dot, Kim goes around the circle clockwise and colors in every nth dot. He continues going around and around the circle coloring in every nth dot, counting each dot whether it is colored in or not, until he has colored in every dot. Which of the following could have been Kim's integer n ?

→ **A. 2**
B. 3
C. 4
D. 5
E. 6



I just drew a diagram with dots on a circle and found that 3 would cover them all. 2 wouldn't because you'd skip the odd ones.

44. Consider the exponential equation $y = Ca^t$, where C and a are positive real constants and t is a positive real number. The value of y decreases as the value of t increases if and only if which of the following statements about a is true?

$y = Ca^t$

F. $-1 < a$
G. $0 < a$
→ **H.** $0 < a < 1$
J. $1 < a < 2$
K. $1 < a$

EXPONENTS
$C > 0$
$a > 0$
$t > 0$
the only way y could decrease as t increases is if a is a FRACTION

45. What is the distance, in coordinate units, between the points $P(-2,-1)$ and $Q(1,3)$ in the standard (x,y) coordinate plane?

A. $\sqrt{5}$
B. $\sqrt{7}$
C. 3
→ **D.** 5
E. 7

Fill in Numbers at any time you can figure in head to get answer, do it.

DISTANCE FORMULA
$D = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$
$= \sqrt{(3-(-1))^2 + (1-(-2))^2}$
$= \sqrt{(4)^2 + (3)^2}$
$\sqrt{16+9} = \sqrt{25}$
You can also sketch and see 3,4,5 TRIANG

$D = Rt$

2 △ △ △ △ △ △ △ △ △ 2

46. During their morning jog in the park, Jean stops at a drinking fountain. Sula continues to jog and gets 10 meters ahead of Jean. Sula is jogging at a constant rate of 2 meters per second, and Jean starts jogging at a constant rate of 2.4 meters per second to catch up to Sula. Which of the following equations, when solved for t, gives the number of seconds Jean will take to catch up to Sula?

DO YOUR FIGURING HERE.

Word problems and Rates

Distance equals rate times Time

When they meet up again, the time will be equal for both of them. Set the Two formulas for the same distance equal to one another

→ **F.** $2t + 10 = 2.4t$

G. $2t - 10 = 2.4t$

H. $\frac{10 + 2.4t}{2.4} = 2t$

J. $2t = 10$

K. $2.4t = 10$

---

47. Which of the following defines the solution set for the system of inequalities below?

$$x \leq 6$$
$$4 + 2x \geq 0$$

Combo inequalities

$4 + 2x \geq 0$ → equals $2x \geq -4$

$x \geq -2$

SAME thing

Combining $x \leq 6$ and $x \geq -2$ is $-2 \leq x \leq 6$

A. $x \geq -2$

B. $x \leq 6$

C. $-8 \leq x \leq 6$

→ **D.** $-2 \leq x \leq 6$

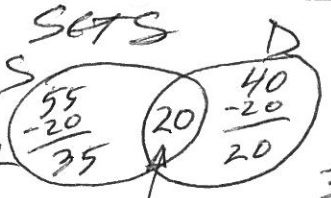
E. $2 \leq x \leq 6$

---

48. At Brookfield High School, 55 seniors are enrolled in the sociology class and 40 seniors are enrolled in the drawing class. Of these seniors, 20 are enrolled in both the sociology class and the drawing class. How many of the 120 seniors enrolled at Brookfield High School are NOT enrolled in either the sociology class or the drawing class?

SETS

S = Sociology
D = Drawing



TOTAL in S or D = $35 + 20 + 20 = 75$

Both/And INTERSECTION ∩

$G_1 + G_2 + \text{Neither} - \text{Both} = \text{Total}$

$55 + 40 + x - 20 = 120$

$x + 75 = 120$

$x = 45$

F. 5

G. 15

H. 20

J. 35

→ **K.** 45

---

49. If two lines in the standard (x,y) coordinate plane are perpendicular and the slope of one of the lines is 3, what is the slope of the other line?

Slope of ⊥ line is the opposite Reciprocal of the line

Slope $= 3 = \frac{3}{1}$

Opposite Reciprocal of $\frac{3}{1}$ is $-\frac{1}{3}$

A. -3

B. -1

→ **C.** $-\frac{1}{3}$

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

E. 3

Mid-Point Formula

50. In the standard (x,y) coordinate plane, (12,3) is half-way between $(2a, a+3)$ and $(4a, a-5)$. What is the value of a?

F. 0
G. 2
H. 3
→ J. 4
K. 6

you only have to set up ONE point to find a

$$12 = \frac{2a+4a}{2} \Rightarrow 24 = 6a \quad 4 = a$$

or

$$3 = \frac{(a+3)+(a-5)}{2} \quad 6 = 2a - 2 \quad 8 = 2a$$

Permutation

N = # of items
R = # of items Taken

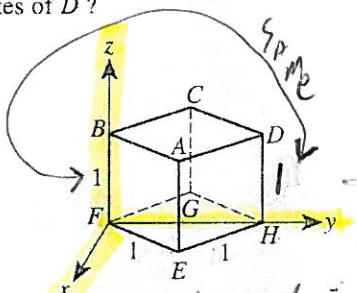
51. How many 3-letter orderings, where no letter is repeated, can be made using the letters of the word GATORS?

A. 3
B. 6
C. 27
→ D. 120
E. 216

$${}_NP_R = \frac{N!}{(N-R)!} \quad \text{ORDER MATTERS} \quad \frac{6!}{(6-3)!} = \frac{6\times5\times4\times\cancel{3!}}{\cancel{3!}} = 120$$

(x, y, z) Coordinate Planes

52. As shown in the (x,y,z) coordinate space below, the cube with vertices A through H has edges that are 1 coordinate unit long. The coordinates of F are (0,0,0), and H is on the positive y-axis. What are the coordinates of D?



To get your bearings, reference back to the (x, y) coordinate plane. Point D would move up from (x, y) and have the same z value as Point B

H

F. (0,1,1)
G. $(0,\sqrt{2},0)$
→ H. $(0,\sqrt{2},1)$
J. $(0,\sqrt{2},\sqrt{3})$
K. (1,1,1)

$1^2 + 1^2 = (\text{Point } H)^2$ → Point D has same y-value as Point H

$2^2 = (\text{Point } H)^2 = \sqrt{2} = \text{Point } H$

Rules of Logarithms

53. Whenever x, y, and z are positive real numbers, which of the following expressions is equivalent to $2\log_3 x + \frac{1}{2}\log_6 y - \log_3 z$?

B

A. $\log_3\left(\frac{x^2y}{z}\right)$
→ B. $\log_3\left(\frac{x^2}{z}\right) + \log_6(\sqrt{y})$
C. $\log_3\left(\frac{z}{x^2}\right) + \log_6\left(\frac{y}{2}\right)$
D. $\log_3(x-z) + \log_6(\sqrt{y})$
E. $2\log_3(x-z) + \log_6\left(\frac{y}{2}\right)$

$$2\log_3 x + \tfrac{1}{2}\log_6 y - \log_3 z$$

$$\log_3 x^2 + \log_6 y^{\frac{1}{2}} + (-1\log_3 z)$$

$$\log_3 x^2 + \log_3 z^{-1} + \log_6 \sqrt{y}$$

$$\log_3 (x^2 * z^{-1}) + \log_6 \sqrt{y}$$

$$\log_3\left(\frac{x^2}{z}\right) + \log_6 \sqrt{y}$$

2 △ △ △ △ 2

Regardless of sign, what would produce the biggest number

54. If $2 \le x \le 5$ and $-4 \le y \le -3$, what is the maximum value of $|y - 2x|$?

G

F. 20
G. 14
H. 13
J. 8
K. 7

largest $x \to 5$

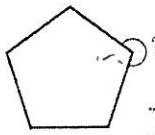
largest $y \to |-4| = 4$

Take the extreme of both. $|-4-2(5)| =$

$|-4-10| = 14$

55. The measure of each interior angle of a regular n-sided polygon is $\frac{(n-2)180°}{n}$. A regular pentagon is shown below. What is the measure of the designated angle?

D



A. 108°
B. 144°
C. 198°
D. 252°
E. 288°

TOTAL Number of degrees around a Fixed Point is 360°

INTERNAL Angle Measurement is

$\frac{(5-2)180°}{5} = 108°$ $\quad 360° - 108° = 252$

56. Which of the following trigonometric functions has an amplitude of 2 ?

(Note: The *amplitude* of a trigonometric function is $\frac{1}{2}$ the nonnegative difference between the maximum and minimum values of the function.)

F

F. $f(x) = 2 \sin x$
G. $f(x) = 2 \tan x$
H. $f(x) = \sin\left(\frac{1}{2}x\right)$
J. $f(x) = \cos 2x$
K. $f(x) = \frac{1}{2}\cos x$

Advanced Trigonometry

STANDARD form

$y = A \overset{\sin \text{ or } \cos}{\square}(Bx - C) + D$

Tangent graphs Don't have Amplitudes

$|A|$ is the Amplitude

B = Period or duration of x values

C = change in degrees or radians. L/R change in position

D = up or down change in position

57. Which of the following is an equivalent expression for r in terms of S and t whenever r, S, and t are all distinct and $S = \frac{rt-3}{r-t}$?

A

A. $\frac{St-3}{S-t}$
B. $\frac{S-3}{S-1}$
C. $\frac{S-t}{S-3}$
D. $\frac{St-3}{S+t}$
E. $\frac{3}{t-S}$

All you're doing here is solving for r

$S(r-t) = rt-3$

$Sr - St = rt - 3$

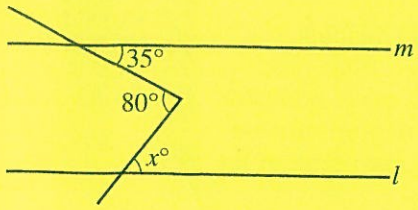
$Sr - rt = St - 3$

$r(S-t) = St-3$

$r = \frac{St-3}{S-t}$

GO ON TO THE NEXT PAGE.

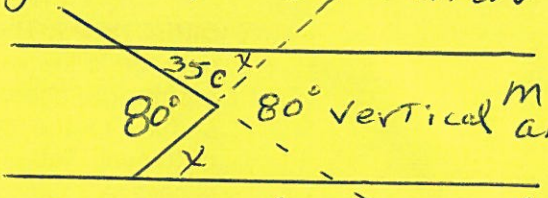
58. In the figure below, lines l and m are parallel and angle measures are as marked. If it can be determined, what is the value of x ?



G

F. 35
G. 45
H. 65
J. 80
K. Cannot be determined from the given information

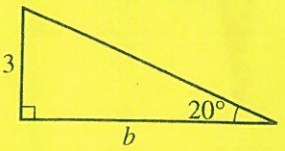
Use Extension lines to help you find information



C equals 100° because of Supplementary Angles

$x = 180 - (35 + 100) = 45$

59. In the triangle below, where the 2 given side lengths are expressed in feet, what is the value of b ?



E

A. 3 cos 20°
B. 3 sin 20°
C. 3 tan 20°
D. 3 sin 70°
→E. 3 tan 70°

ADVANCED TRIGONOMETRY Cofunction Identities

$\tan\theta = \cot(90-\theta)$

You KNOW $\tan 20° = \frac{3}{b}$ and $b = \frac{3}{\tan 20}$

HOWEVER this is NOT ONE of your choices

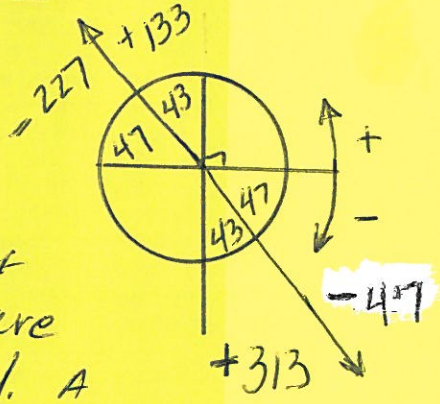
If $\tan 20° = \cot 70°$ and $\cot\theta = \frac{1}{\tan\theta}$, then

$\frac{3}{\tan 20} = \frac{3}{\frac{1}{\tan 70°}} = 3\tan 70°$

60. An angle in standard position in the standard (x,y) coordinate plane has its vertex at the origin and its initial side on the positive x-axis. If the measure of an angle in standard position is 1,573°, it has the same terminal side as an angle of each of the following measures EXCEPT:

K

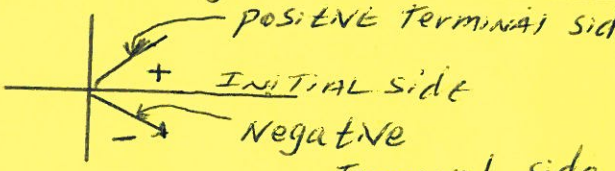
F. −587°
G. −227°
H. 133°
J. 493°
K. 573°



All reference angles are included. A reference angle is the angle closest to the x-axis.

$180 - 133 = 47°$

INITIAL SIDE is where the angle STARTS. The terminal side is where the angle ends.



Each rotation around an initial side is 360° or 2π radians

$1573 \div 360 = 4$ Remainder 133°

F) $-587 + 360 = -227$ This is ok because $-227 + -133 = -360$
-227 is the same angle as $+133$

G) -227 is going NEGATIVE from x-axis

H) 133 is going POSITIVE from x-axis

J) $493 = 133 + 360$ or $493 - 360 = 133$

K) $573 - 360 = 213$ No Relationship to this