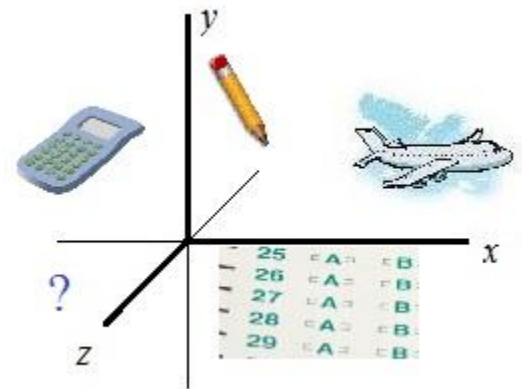


25 Challenging Test Prep Questions

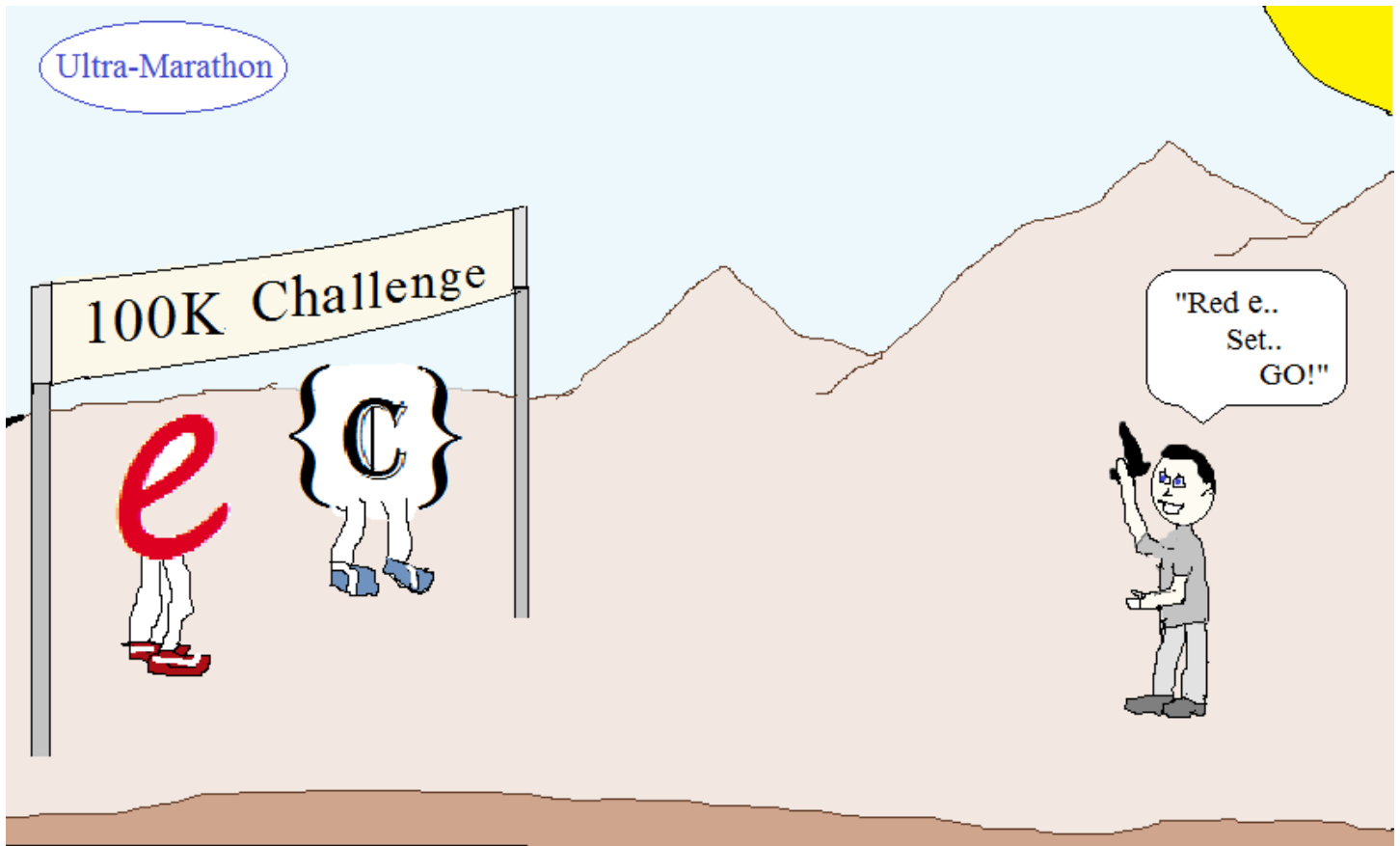
Twenty-five multiple choice math questions (and solutions)



Mathplane.com

Topics include linear equations, geometry concepts, exponents, domain, radicals, sequences, word problems, and more.

Ultra-Marathon



Testing the limits of endurance,
these math figures will run on and on...

LanceAF #87 5-24-13
www.mathplane.com

Try to answer the 25 questions in 25 minutes....

25 possibly confusing or challenging math questions from the SAT/ACT

Read and solve each question carefully!!

1) What is the slope of the line $4y = 5x - 7$?

- a) 4
- b) 5
- c) $4/5$
- d) $5/4$
- e) -7

2) What is the y-intercept of $2y = -3x + 8$?

- a) -3
- b) 2
- c) 4
- d) 8
- 3) $-3/2$

3) What is the slope of the line $-3x - 4y = 7$?

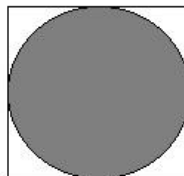
- a) 3
- b) 4
- c) $3/4$
- d) $-3/4$
- e) -3

4) A rectangle has a perimeter of 30 feet. If the width is 3 feet longer than the length, how many feet is the length?

- a) 6
- b) 7
- c) 8
- d) 9
- e) 12

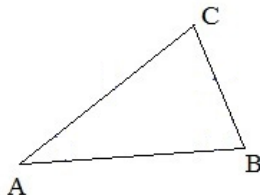
5) A square has a perimeter of 40. What is the area of a circle inscribed in that square?

- a) 100π
- b) 50π
- c) 40π
- d) 25π
- e) 20π



6) If $\angle CAB \cong \angle CBA$, then which of the following must be true?

- a) $AB = AC$
- b) $AC = BC$
- c) $AB \neq AC$
- d) $AC \neq BC$
- e) Not enough information

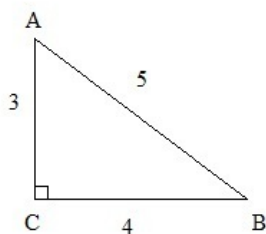


7) What is $(3x - 1)^2$?

- a) $9x^2 + 1$
- b) $9x^2 - 1$
- c) $9x^2 - 6x + 1$
- d) $6x^2 - 3x + 1$
- e) $6x^2 - 4x + 1$

8) What is $\sin A$?

- a) $3/4$
- b) $3/5$
- c) $4/5$
- d) $4/3$
- e) 1



9) If $f(x) = -x^2$, what is $f(f(3))$?

- a) 81
- b) -81
- c) 27
- d) -27
- e) 9

10) $\left(\frac{1}{9}\right)^{-\frac{1}{2}} =$

- a) $1/3$
- b) $-1/3$
- c) 3
- d) -3
- e) $-1/18$

11) What is the domain of the following function?

$$f(x) = \frac{1}{\sqrt{2-x}}$$

- a) $x < 2$
- b) $x \leq 2$
- c) $x > 2$
- d) $x \geq 2$
- e) all real numbers; $x \neq 2$

12) John drives to work at an average of 60 mph. He takes the same route home during rush hour, driving at an average of 40 mph. What is his average speed in mph for the entire trip?

- a) 40
- b) 48
- c) 50
- d) 52
- e) 60

13) $(\sqrt{x} + 2)^2 = ?$

- a) $x^2 + 2x + 4$
- b) $x + 4\sqrt{x} + 2$
- c) $x + 2\sqrt{x}$
- d) $x + 4$
- e) $x + 4(\sqrt{x} + 1)$

14) Which value is approximately 5 radians?

- a) $\frac{5\pi}{2}$
- b) $\frac{5}{\pi}$
- c) 106.6°
- d) 286.6°
- e) 900°

15) Find the next number in the following arithmetic sequence: $\frac{1}{2}$ $\frac{2}{3}$ $\frac{5}{6}$ 1

- a) $\frac{8}{9}$
- b) 2
- c) $1\frac{1}{4}$
- d) $1\frac{1}{6}$
- e) $\frac{7}{8}$

16) $\sqrt{8} - \sqrt{2} =$

- a) $\frac{\sqrt{6}}{2}$
- b) 3
- c) $\sqrt{2}$
- d) $\sqrt{6}$
- e) 2

17) How many irrational numbers are between 2 and 9?

- a) 4
- b) 5
- c) 6
- d) 7
- e) more than 10

18) $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right) = X^\circ$

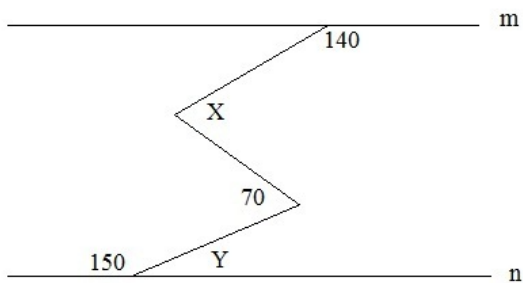
- a) 30
- b) 45
- c) 60
- d) 75
- e) 90

19) $(2Y^2)^3 =$

- a) $2Y^5$
- b) $2Y^6$
- c) $6Y^5$
- d) $6Y^6$
- e) $8Y^6$

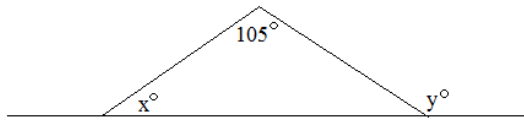
20) If $m \parallel n$, what is $2X - Y$?

- a) 100
- b) 110
- c) 120
- d) 130
- e) 140



21) What is y in terms of x ?

- a) $x + 75$
- b) $75 - x$
- c) $x + 105$
- d) $x - 105$
- e) $105 - x$



22) Let $f(x) = x^2 + 9x + 1$
If $g(x)$ is a transformation that moves $f(x)$ up 1 unit and right 1 unit, then $g(x) =$

- a) $x^2 + 7x - 6$
- b) $x^2 + 10x + 2$
- c) $x^2 + 8x + 2$
- d) $2x^2 + 10x + 2$
- e) $x^2 + 11x + 12$

23) Two variables, p and q , are inversely proportional such that when p is 5, q is 10.
What is q when p is 2?

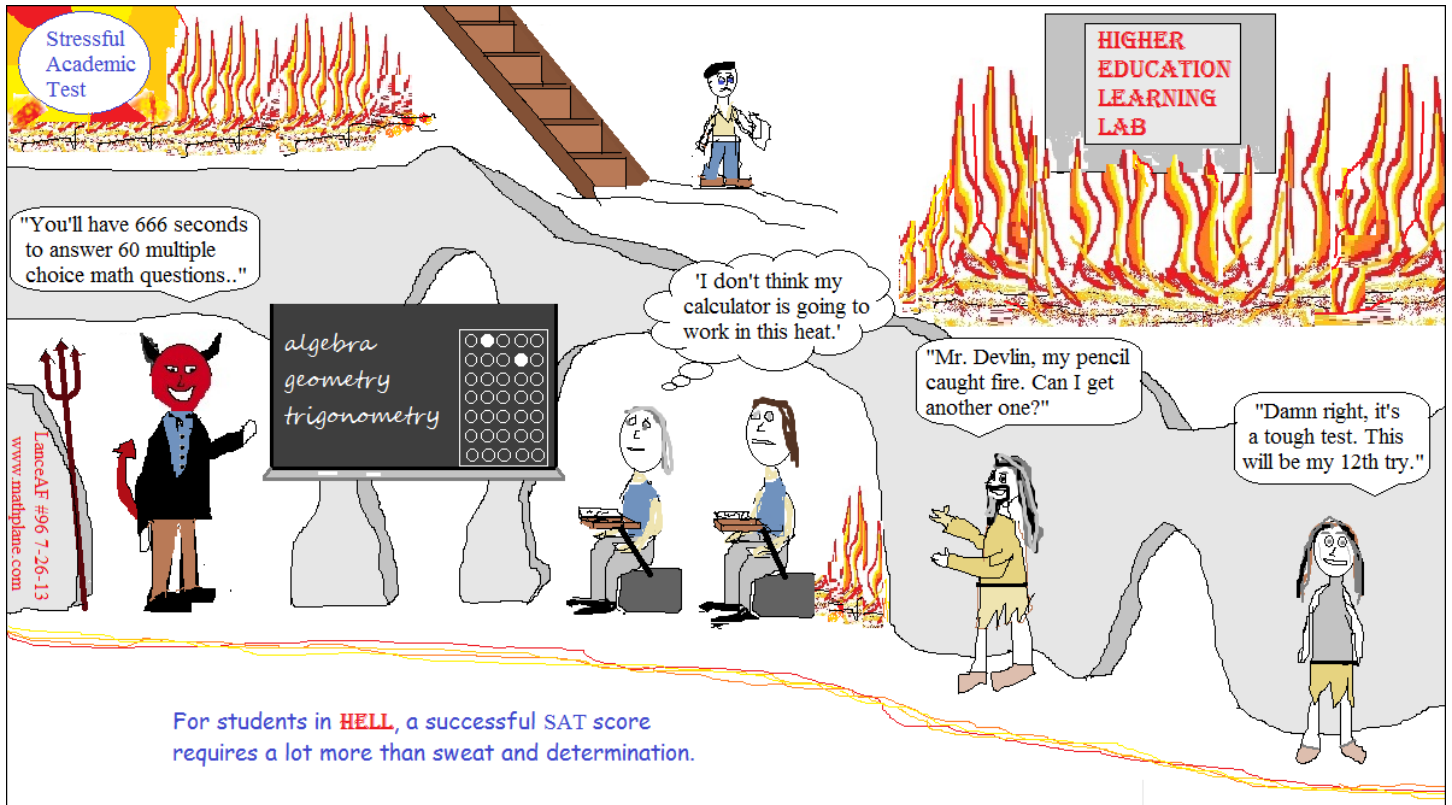
- a) $1/2$
- b) 1
- c) 4
- d) 10
- e) 25

24) If $ab = 2$, then $a^3b^4 + a^4b^5 =$

- a) $3a + 4b$
- b) $7a + 9b$
- c) $24b$
- d) $16b$
- e) $7a$

25) Bill ran around a rectangular park at 10 feet per second.
The park's area is 160,000 square feet.
If the length of the park is 4 times its width, how long did it take Bill to run around the park once?

- a) 40 seconds
- b) 80 seconds
- c) 100 seconds
- d) 200 seconds
- e) 400 seconds



SOLUTIONS ->

25 possibly confusing or challenging math questions from the SAT/ACT

SOLUTIONS

1) What is the slope of the line $4y = 5x - 7$?

- a) 4
- b) 5
- c) $4/5$
- d) $5/4$**
- e) -7

Slope intercept form: $y = mx + b$

$$y = \frac{5}{4}x - \frac{7}{4}$$

2) What is the y-intercept of $2y = -3x + 8$?

- a) -3
- b) 2
- c) 4**
- d) 8
- 3) $-3/2$

Slope intercept form: $y = mx + b$

$$y = -\frac{3}{2}x + 4$$

3) What is the slope of the line $-3x - 4y = 7$?

- a) 3
- b) 4
- c) $3/4$
- d) $-3/4$**
- e) -3

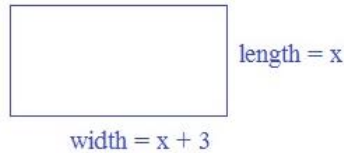
$$-4y = 3x + 7$$

$$y = -\frac{3}{4}x - \frac{7}{4}$$

4) A rectangle has a perimeter of 30 feet. If the width is 3 feet longer than the length, how many feet is the length?

- a) 6**
- b) 7
- c) 8
- d) 9
- e) 12

$$\begin{aligned} 2(x) + 2(x + 3) &= 30 \\ 4x + 6 &= 30 \\ 4x &= 24 \\ x &= 6 \\ x + 3 &= 9 \end{aligned}$$

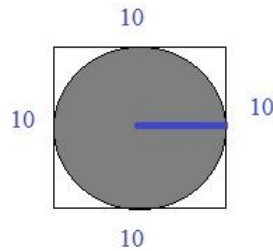


width is longer than the length!

5) A square has a perimeter of 40. What is the area of a circle inscribed in that square?

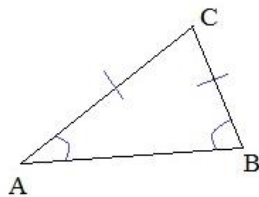
- a) 100π
- b) 50π
- c) 40π
- d) 25π**
- e) 20π

Each side is 10.
So, radius of circle is 5
Area is $\pi r^2 = 25\pi$



6) If $\angle CAB = \angle CBA$, then which of the following must be true?

- a) $AB = AC$
- b) $AC = BC$
- c) $AB \neq AC$
- d) $AC \neq BC$
- e) Not enough information



b) Although angles A and B don't LOOK alike, they are given as congruent.. Therefore, the opposite sides must be congruent as well (even though they don't look alike!)

$AB = AC$ if it is an equilateral triangle..
 $AB \neq AC$ if it is not an equilateral triangle.

Therefore, a) and c) are may or may not be true..

7) What is $(3x - 1)^2$?

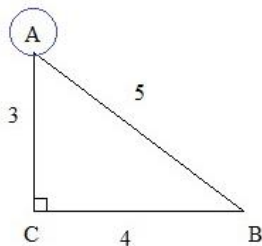
- a) $9x^2 + 1$
- b) $9x^2 - 1$
- c) $9x^2 - 6x + 1$
- d) $6x^2 - 3x + 1$
- e) $6x^2 - 4x + 1$

Rewrite the equation and solve:

$$\begin{aligned} (3x - 1)(3x - 1) &= 9x^2 - 3x - 3x + 1 \\ &= 9x^2 - 6x + 1 \end{aligned}$$

8) What is $\sin A$?

- a) $3/4$
- b) $3/5$
- c) $4/5$
- d) $4/3$
- e) 1



\sin is $\frac{\text{'opposite'}}{\text{'hypotenuse'}}$

So, $\sin A = 4/5$

(Note: $\sin B = 3/5$)

9) If $f(x) = -x^2$, what is $f(f(3))$?

- a) 81
- b) -81
- c) 27
- d) -27
- e) 9

$$\begin{aligned} f(3) &= -(3)^2 = -9 \\ f(f(3)) &= f(-9) = -(-9)^2 = -81 \end{aligned}$$

Note the order of operations -- exponent is calculated before multiplication

10) $\left(\frac{1}{9}\right)^{\frac{-1}{2}} =$

- a) $1/3$
- b) $-1/3$
- c) 3
- d) -3
- e) $-1/18$

$$\left(\frac{1}{9}\right)^{\frac{-1}{2}} = \left(\frac{9}{1}\right)^{\frac{1}{2}} = 3$$

Also, $\left(\frac{1}{9}\right)^{\frac{1}{2}} = \frac{1}{3}$
 and $(1/3)^{-1} = 3$

11) What is the domain of the following function?

$$f(x) = \frac{1}{\sqrt{2-x}}$$

- a) $x < 2$
- b) $x \leq 2$
- c) $x > 2$
- d) $x \geq 2$
- e) all real numbers; $x \neq 2$

Domain restrictions include:

- no zero in the denominator
- no negatives under a square root.

Therefore, $x \neq 2$

and $2 - x \geq 0 \implies x \leq 2$

$$x < 2$$

12) John drives to work at an average of 60 mph. He takes the same route home during rush hour, driving at an average of 40 mph. What is his average speed in mph for the entire trip?

- a) 40
- b) 48
- c) 50
- d) 52
- e) 60

Assume one-way trip = 240 miles

time to work = 4 hours

time back home = 6 hours

total time = 10 hours

total distance = 480 miles

average speed = 480 miles/10 hours = 48

mph

The first instinct is to take the average of 40 and 60: 50
But, this is a *weighted* average because more time is spent going 40 mph! Since more time is spent going 40, the average speed of the entire trip will be less than 50...

13) $(\sqrt{x} + 2)^2 = ?$

- a) $x^2 + 2x + 4$
- b) $x + 4\sqrt{x} + 2$
- c) $x + 2\sqrt{x}$
- d) $x + 4$
- e) $x + 4(\sqrt{x} + 1)$

$$(\sqrt{x} + 2)(\sqrt{x} + 2) = x + 2\sqrt{x} + 2\sqrt{x} + 4$$

$$= x + 4\sqrt{x} + 4$$

$$= x + 4(\sqrt{x} + 1)$$

14) Which value is approximately 5 radians?

- a) $\frac{5\pi}{2}$
- b) $\frac{5}{\pi}$
- c) 106.6°
- d) 286.6°
- e) 900°

$$180^\circ = \pi \text{ radians} \cong 3.14 \text{ rad}$$

$$5 \text{ rad} \cdot \frac{180^\circ}{3.14 \text{ rad}} = 286.6^\circ$$

$$\frac{180^\circ}{3.14 \text{ rad}} \cong 1$$

15) Find the next number in the following arithmetic sequence: $\frac{1}{2}$ $\frac{2}{3}$ $\frac{5}{6}$ 1

- a) $\frac{8}{9}$
- b) 2
- c) $1 \frac{1}{4}$
- d) $1 \frac{1}{6}$
- e) $\frac{7}{8}$

$$\frac{1}{2} \quad \frac{2}{3} \quad \frac{5}{6} \quad 1 \quad 1 \frac{1}{6}$$

(adding $\frac{1}{6}$)

$$\frac{3}{6} \quad \frac{4}{6} \quad \frac{5}{6} \quad \frac{6}{6} \quad \frac{7}{6}$$

16) $\sqrt{8} - \sqrt{2} =$

- a) $\frac{\sqrt{6}}{2}$
- b) 3
- c) $\sqrt{2}$**
- d) $\sqrt{6}$
- e) 2

$$\begin{aligned} \sqrt{8} &= \sqrt{2 \cdot 4} = 2\sqrt{2} \\ 2\sqrt{2} - 1\sqrt{2} &= 1\sqrt{2} \\ &= \sqrt{2} \end{aligned}$$

SOLUTIONS

17) How many irrational numbers are between 2 and 9?

- a) 4
- b) 5
- c) 6
- d) 7
- e) more than 10**

There are an infinite number of irrational numbers between 2 and 9...
Examples include π , $\pi + 1$, $\pi + 1.2$, $1.003 + \pi$

18) $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right) = X^\circ$

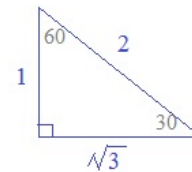
- a) 30**
- b) 45
- c) 60
- d) 75
- e) 90

Rewrite $\frac{\sqrt{3}}{3}$ as $\frac{1}{\sqrt{3}}$

then, construct a right triangle with

$$\tan x = \frac{1}{\sqrt{3}}$$

30-60-90



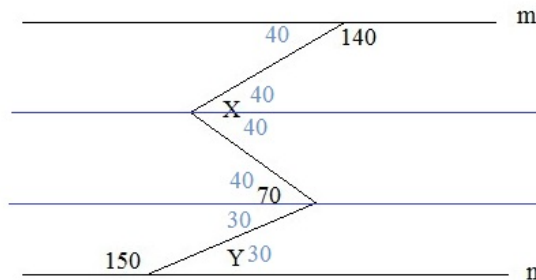
19) $(2Y^2)^3 =$

- a) $2Y^5$
- b) $2Y^6$
- c) $6Y^5$
- d) $6Y^6$
- e) $8Y^6$**

$$\begin{aligned} (2Y^2)(2Y^2)(2Y^2) \\ 8Y^6 \end{aligned}$$

20) If $m \parallel n$, what is $2X - Y$?

- a) 100
- b) 110
- c) 120
- d) 130**
- e) 140



Add parallel lines and label angles

- supp angles add up to 180
- parallel lines cut by transversal have congruent alt. interior angles

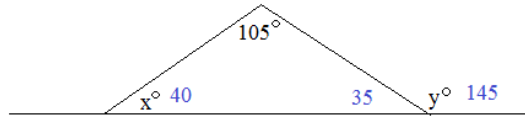
$$\begin{aligned} X &= 40 + 40 = 80 \\ Y &= 30 \end{aligned}$$

$$2X - Y = 160 - 30 = 130$$

21) What is y in terms of x ?

- a) $x + 75$
- b) $75 - x$
- c) $x + 105$**
- d) $x - 105$
- e) $105 - x$

SOLUTIONS



Exterior angle theorem
("exterior angle of triangle equals sum of the remote interior angles")

To confirm, let $x = 40$

$y = 145...$

22) Let $f(x) = x^2 + 9x + 1$
If $g(x)$ is a transformation that moves $f(x)$ up 1 unit and right 1 unit, then $g(x) =$

- a) $x^2 + 7x - 6$**
- b) $x^2 + 10x + 2$
- c) $x^2 + 8x + 2$
- d) $2x^2 + 10x + 2$
- e) $x^2 + 11x + 12$

Shift right 1 unit: $(x - 1)^2 + 9(x - 1) + 1$
 $x^2 - 2x + 1 + 9x - 9 + 1$
 $x^2 + 7x - 7$ then, shift up 1 unit $x^2 + 7x - 7 + 1$

23) Two variables, p and q , are inversely proportional such that when p is 5, q is 10.
What is q when p is 2?

- a) $1/2$
- b) 1
- c) 4
- d) 10
- e) 25**

Since variables are inversely proportional:

$q = \frac{k}{p}$

$10 = \frac{k}{5}$

constant of proportion is 50

$q = \frac{50}{p}$ so, if p is 2, then q is 25

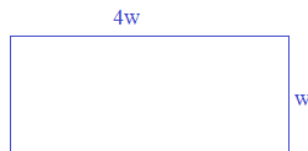
24) If $ab = 2$, then $a^3b^4 + a^4b^5 =$

- a) $3a + 4b$
- b) $7a + 9b$
- c) $24b$**
- d) $16b$
- e) $7a$

$a^3b^3 \cdot b + a^4b^4 \cdot b$
 $(ab)^3 \cdot b + (ab)^4 \cdot b$
 $2^3 \cdot b + 2^4 \cdot b$
 $8b + 16b = 24b$

25) Bill ran around a rectangular park at 10 feet per second.
The park's area is 160,000 square feet.
If the length of the park is 4 times its width, how long did it take Bill to run around the park once?

- a) 40 seconds
- b) 80 seconds
- c) 100 seconds
- d) 200 seconds**
- e) 400 seconds



$4w^2 = 160,000$

$w^2 = 40,000$

$w = 200$

and, length is $4 \times 200 = 800$

perimeter of park is $2(200 + 800) = 2000$ ft

$d = \text{rate} \times \text{time}$

$2000 \text{ ft} = 10 \frac{\text{ft}}{\text{s}} \times \text{time}$ $\text{time} = 200 \text{ seconds}$

So, how did you do? Want more test prep questions?

1) When $x = 4$ and $y = -3$, the value of $2x^2 - 2y$ is

- a) 10
- b) 22
- c) 26
- d) 38
- e) 54

2) A car gets 30 miles per gallon. How much will it cost to drive 1000 miles?

- a) \$177
- b) \$269
- c) \$299
- d) \$508
- e) \$538

3) Find the greatest common factor of 36, 84, and 132.

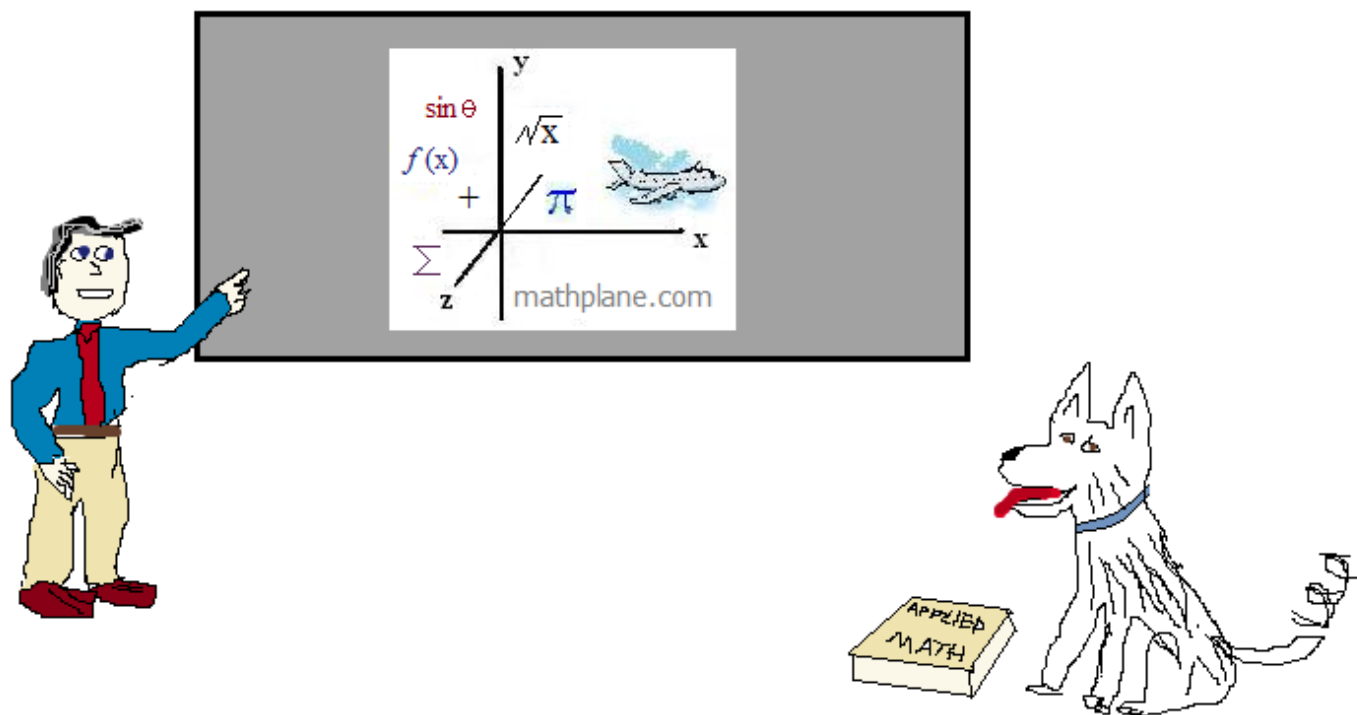
- a) 2
- b) 4

200 SAT/ACT
Math
Practice Questions
(and, Solutions)

Available at Mathplane.com. Just **contact us** or visit the **Travel Log section** to order the complete packet. (\$5 for .pdf or .docx format)

Proceeds will go to site maintenance and improvement (and treats for Oscar the dog!). Thanks for visiting!

Find us at Facebook, Google+, and Pinterest...



Mathplane *Express* for mobile at Mathplane.org

And, Mathplane stores at TES.com and TeachersPayTeachers.com