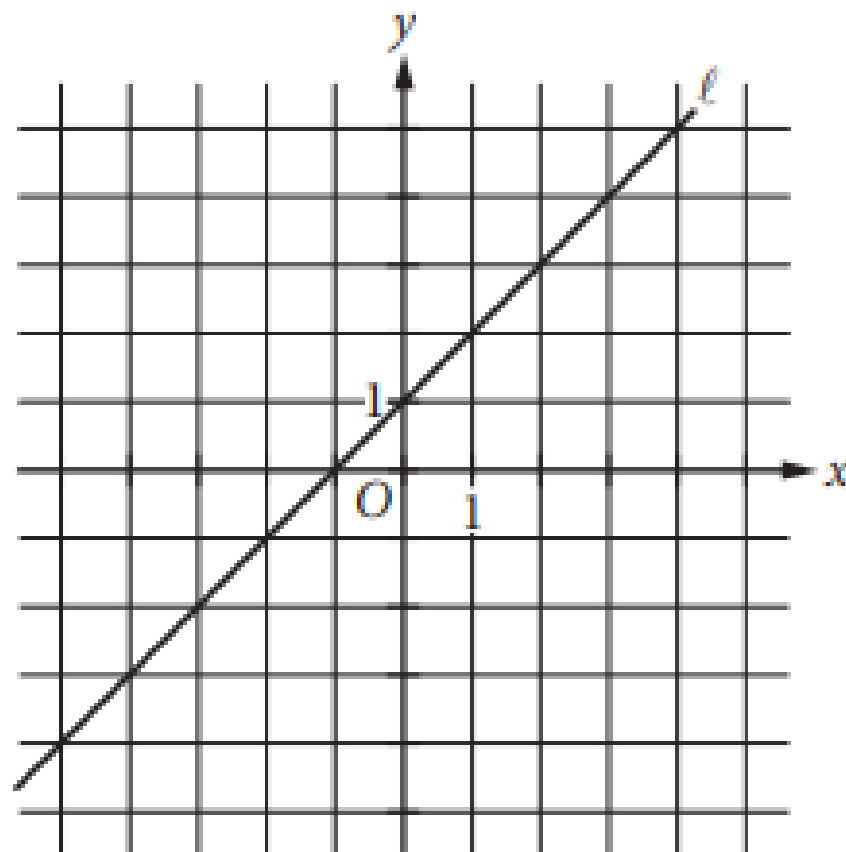# The SAT – Practice test 5 - Section 3
Math Test – 25 minutes, 20 questions
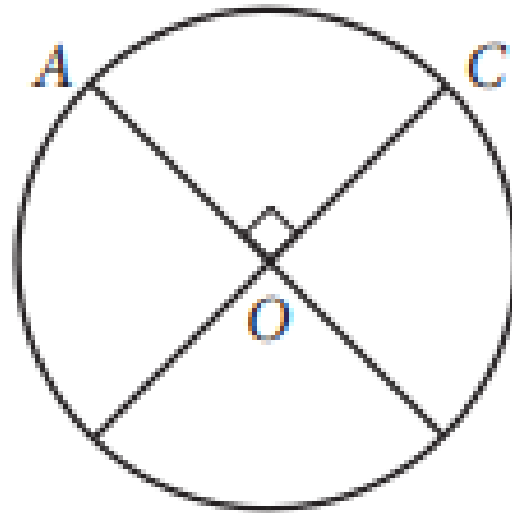
Q1

Which of the following is an equation of line ℓ in the xy-plane above?

A) $x = 1$

B) $y = 1$

C) $y = x$

D) $y = x + 1$

What is an equation for a line?

What is the slope?

Q2

The circle above with center O has a circumference of 36. What is the length of minor arc $\overset{\frown}{AC}$?

A) 9

B) 12

C) 18

D) 36

What does circumference mean?

What do you know about the arc?

Q3

What are the solutions of the quadratic equation
$4x^2 - 8x - 12 = 0$?

A) $x = -1$ and $x = -3$

B) $x = -1$ and $x = 3$

C) $x = 1$ and $x = -3$

D) $x = 1$ and $x = 3$

What is your first step?

Q3

What are the solutions of the quadratic equation

$$4x^2 - 8x - 12 = 0 \ ?$$

A) $x = -1$ and $x = -3$

B) $x = -1$ and $x = 3$

C) $x = 1$ and $x = -3$

D) $x = 1$ and $x = 3$

4, 8, & 12 can be evenly divided by 4

$$4(X^2-2x-3) = 0$$

Now divide both sides by 4 to get rid of it

You are looking for what are the numbers that X can be that will make $X^2-2x-3 = 0$

Remember that:

+ * + = +

- * - = +

- * + = -

+ * - = -

Therefore $X^2-2x-3=0$ will factor into something like (X+_)(X-_)=0 because of the -3

Also, because -2x has a – sign, the (x-__) will have the bigger absolute value for the missing number

What are two numbers when multiplied together = -3 and the absolute value of the bigger number will be negative?   (1, -3)

(X+1) (X-3)=0   Therefore if X= -1 or +3, one of those factors is 0 and 0 times any number is 0

Q4

Which of the following is an example of a function whose graph in the xy-plane has no x-intercepts?   *What is an x intercept?*

A) A linear function whose rate of change is not zero

B) A quadratic function with real zeros

C) A quadratic function with no real zeros

D) A cubic polynomial with at least one real zero

Q4

Which of the following is an example of a function whose graph in the *xy*-plane has no *x*-intercepts?

A) A linear function whose rate of change is not zero   Y=mX + b and m is not 0

B) A quadratic function with real zeros

C) A quadratic function with no real zeros

D) A cubic polynomial with at least one real zero

No x intercept means the function will not cross the x line on an X Y graph
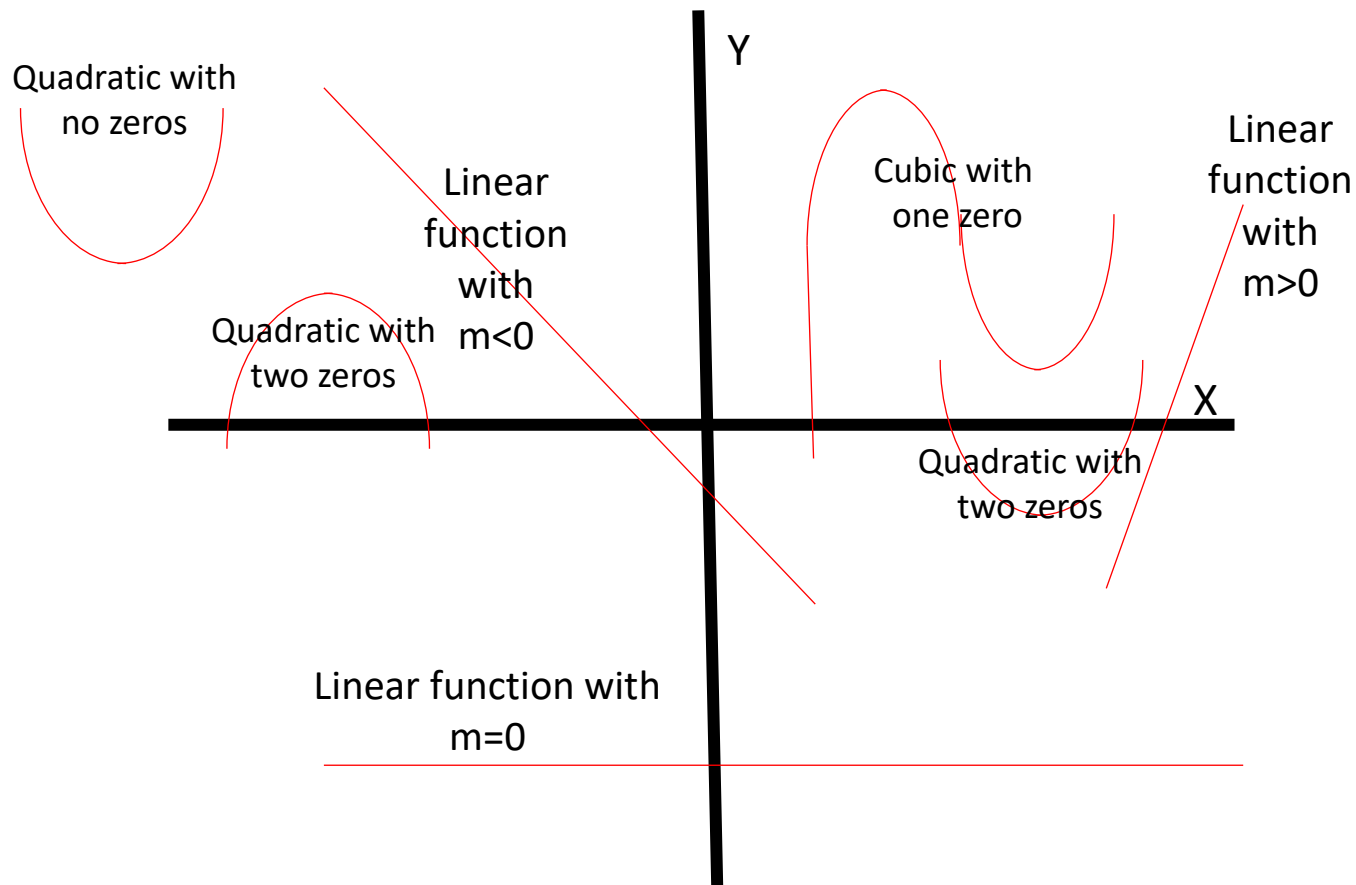
$$\sqrt{k+2} - x = 0$$

Q5 In the equation above, k is a constant. If $x = 9$, what is the value of k ?

A) 1

B) 7

C) 16

D) 79

Substitute 9 for x $\sqrt{k+2}$ - 9 = 0

Add 9 to both sides $\sqrt{k+2}$ = 9

Square both sides   k + 2   = 81

Subtract 2 from both sides   k   = 79

Q6

Which of the following is equivalent to the sum of the expressions $a^2 - 1$ and $a + 1$?

A) $a^2 + a$

B) $a^3 - 1$

C) $2a^2$

D) a^3

What does sum mean?

Q6

Which of the following is equivalent to the sum of the expressions $a^2 - 1$ and $a + 1$?

A) $a^2 + a$

B) $a^3 - 1$

C) $2a^2$

D) a^3

$$
\begin{array}{r}
a^2 \qquad -1 \\
+ \qquad a \;+1 \\
\hline
a^2 + a
\end{array}
$$

Q7

Jackie has two summer jobs. She works as a tutor, which pays $12 per hour, and she works as a lifeguard, which pays $9.50 per hour. She can work ~~no more than 20 hours per week~~, but she wants to ~~earn at least $220 per week~~. Which of the following systems of inequalities represents this situation in terms of x and y, where x is the number of hours she tutors and y is the number of hours she works as a lifeguard?

A) $12x + 9.5y \leq 220$
    $x + y \geq 20$

B) $12x + 9.5y \leq 220$
    $x + y \leq 20$

C) $12x + 9.5y \geq 220$
    $x + y \leq 20$

D) $12x + 9.5y \geq 220$
    $x + y \geq 20$

What do the symbols < = and > mean?

What do the words "no more than" and "at least mean?

Q8   In air, the speed of sound S, in meters per second, is a linear function of the air temperature T, in degrees Celsius, and is given by $S(T) = 0.6T + 331.4$. Which of the following statements is the best interpretation of the number 331.4 in this context?

A) The speed of sound, in meters per second, at 0°C

B) The speed of sound, in meters per second, at 0.6°C

C) The increase in the speed of sound, in meters per second, that corresponds to an increase of 1°C

D) The increase in the speed of sound, in meters per second, that corresponds to an increase of 0.6°C

Q9

$$y = x^2$$

$$2y + 6 = 2(x + 3)$$

If (x, y) is a solution of the system of equations above and $x > 0$, what is the value of xy ?

A) 1

B) 2

C) 3

D) 9

$$y = x^2$$
$$2y + 6 = 2(x + 3)$$

Q9

If (x, y) is a solution of the system of equations above and $x > 0$, what is the value of xy ?

A) 1

B) 2

C) 3

D) 9

2y + 6 = 2(x+3)

2y +6 = 2x +6

Subtract 6 from each side   2Y = 2x

Divide each side by 2   y = x

But if y also = x² then x and y must = 1

xy = 1 X 1 = 1

Q10

If $a^2 + b^2 = z$ and $ab = y$, which of the following is equivalent to $4z + 8y$?

A) $(a + 2b)^2$

B) $(2a + 2b)^2$ *What is your first step?*

C) $(4a + 4b)^2$

D) $(4a + 8b)^2$

Q10

If $a^2 + b^2 = z$ and $ab = y$, which of the following is equivalent to $4z + 8y$?

A) $(a + 2b)^2$

B) $(2a + 2b)^2$

C) $(4a + 4b)^2$

D) $(4a + 8b)^2$

Substitute equations for z and y	$4 (a^2 + b^2) + 8 (ab)$
Do multiplication	$4a^2 + 4b^2 + 8ab$
Rearrange the terms	$4a^2 \quad + 8ab \ +4b^2$
Factor	$(2a + 2b) (2a + 2b)$
Simplify	$(2a + 2b)^2$

Q11

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

A) 11

B) 22

C) 44

D) 66

Q11

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

A) 11

B) 22

C) 44

D) 66

From the reference information on your test....

$$V = \pi r^2 h$$

If we let r = cylinder A radius and h = cylinder A height
Then the new cylinder radius is 2r and the height is ½h

New cylinder volume is $= \pi(2r)^2(½h)$
$$= \pi 4r^2(½h)$$
$$= \pi 2r^2 h$$

If $\pi r^2 h$ = 22 cubic inches, then $2\pi r^2 h$ = 44 cubic inches

Q12

Which of the following is equivalent to $9^{\frac{3}{4}}$?

A) $\sqrt[3]{9}$

B) $\sqrt[4]{9}$

C) $\sqrt{3}$

D) $3\sqrt{3}$

What does $9^{\frac{1}{2}}$ mean?

What does $9^{\frac{1}{4}}$ mean?

What does 9^3 mean?

Which of the following is equivalent to $9^{\frac{3}{4}}$?

Q12

A) $\sqrt[3]{9}$

B) $\sqrt[4]{9}$

C) $\sqrt{3}$

D) $3\sqrt{3}$

$9 = 3^2$

Take the fourth root of both sides

$9^{¼} = (3^2)^{¼}$

Based on the properties of exponents:

$(3^2)^{¼} = 3^{½}$

Raise both sides to the 3rd power

$(9^{¼})^3 = 9^{¾} = (3^{½})^3 = 3^{3/2}$

Based on the properties of exponents:

$3^{3/2} = 3^{2/2} \times 3^{½} = 3 \times 3^{½}$

As a check $9^{¾}$ should be close to 9^1 which equals 9 and the answer is
~ 5.1 which is closer than the other answers. Secondly, B & C are the same number.

Q13

At a restaurant, n cups of tea are made by adding t tea bags to hot water. If $t = n + 2$, how many additional tea bags are needed to make each additional cup of tea?

A) None

B) One

C) Two

D) Three

What is the ratio the number cups of tea to tea bags after the first cup of tea?

Q14

$$f(x) = 2^x + 1$$

The function f is defined by the equation above. Which of the following is the graph of $y = -f(x)$ in the xy-plane?

$2^2 = ?$

$2^{\frac{1}{2}} = ?$ *What can't 2^x be?*
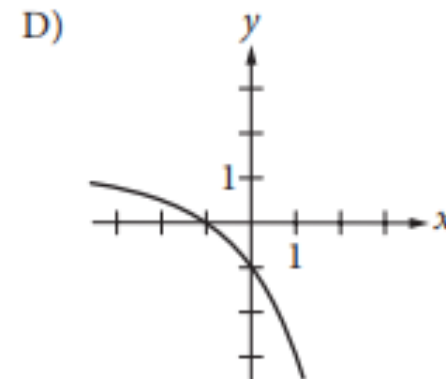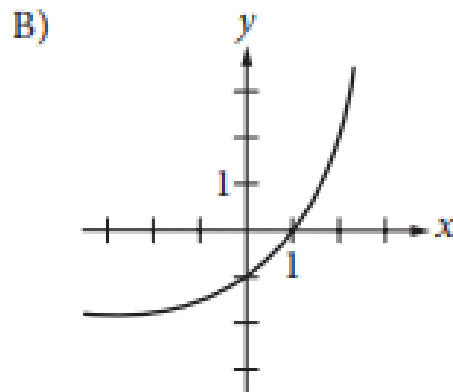
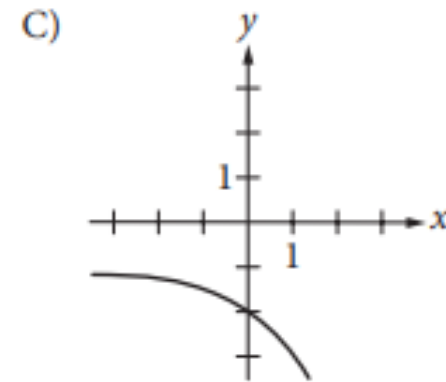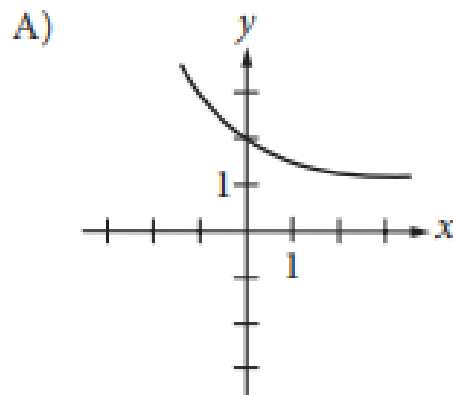$2^{-2} = ?$

Then what can't f(x) be?

Then what can't –f(x) be?

$$f(x) = 2^x + 1$$

Q14

The function f is defined by the equation above. Which of the following is the graph of $y = -f(x)$ in the xy-plane?

So given the previous slide, which is the correct graph?

A)

B)

C)

D)

One key thing to remember … they were asking for the –f(x) and not f(x)

Q15

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by $5. Assuming gasoline costs $4 per gallon, which equation can Alan use to determine how many fewer average miles, m, he should drive each week?

A) $\dfrac{25}{4} m = 95$

B) $\dfrac{25}{4} m = 5$ *How would you set up this problem?*

C) $\dfrac{4}{25} m = 95$ *What are the units for the answer?*

D) $\dfrac{4}{25} m = 5$

Q15

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by $5. Assuming gasoline costs $4 per gallon, which equation can Alan use to determine how many fewer average miles, m, he should drive each week?

A) $\dfrac{25}{4} m = 95$

Consider using dimensional analysis to set up the problem

B) $\dfrac{25}{4} m = 5$

$$\frac{25 \text{ miles}}{1 \text{ gallon}} \times \frac{1 \text{ gallon}}{\$4} = \frac{25 \text{ miles}}{\$4}$$

C) $\dfrac{4}{25} m = 95$

$$\frac{25 \text{ miles}}{\$4} \times \$5 = m \text{ miles}$$

D) $\dfrac{4}{25} m = 5$

So you now have the equation to determine m, but unfortunately, they gave you answers to choose form that don't answer the question directly.

If you multiply each side by 4/25 you get: $5 = m \dfrac{4}{25}$

Q16

Maria plans to rent a boat. The boat rental costs $60 per hour, and she will also have to pay for a water safety course that costs $10. Maria wants to spend no more than $280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

What does "per" mean?

Q16

Maria plans to rent a boat. The boat rental costs $60 per hour, and she will also have to pay for a water safety course that costs $10. Maria wants to spend no more than $280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

Y = mx+b   remember that M is slope or rate

Use Dimension Analysis to make sure units are correct

Total cost $ = $280 = ($60/~~hour~~) (t ~~hours~~) + $10

Subtract $10 from each side $270 = ($60/hour) (t hours)

Divide each side by $60 $270 / ($60/hour) = t hours

t = 4.5 hours

The maximum number of <u>whole</u> hours is 4.

Q17

$$2(p+1) + 8(p-1) = 5p$$

What value of p is the solution of the equation above?

Eliminate the ()	$2p + 2 + 8p - 8 = 5p$
Add the numbers	$10p - 6 = 5p$
Subtract 5p from each side	$5p - 6 = 0$
Add 6 to each side	$5p = 6$
Divide each side by 5	$P = 6/5 = 1.2$

Q18

$$\frac{1}{2}(2x+y) = \frac{21}{2}$$

$$y = 2x$$

The system of equations above has solution (x,y). What is the value of x ?

How would you start?

Q18

$$\frac{1}{2}(2x+y) = \frac{21}{2}$$

$$y = 2x$$

The system of equations above has solution (x, y).
What is the value of x ?

Substitute y in for 2x or ½ y in for x   ½ (y +y) = 21/2

Add the y's in the ()   ½ (2y) = 21/2

Multiply the left side   Y = 21/2

Use the second equation to determine x   X = 21/4

$$\frac{2x+6}{(x+2)^2} - \frac{2}{x+2}$$

19

The expression above is equivalent to $\dfrac{a}{(x+2)^2}$,

where a is a positive constant and $x \neq -2$.

What is the value of a ?

How would you start?

$$\frac{2x+6}{(x+2)^2} - \frac{2}{x+2}$$

19

The expression above is equivalent to $\dfrac{a}{(x+2)^2}$,

where a is a positive constant and $x \neq -2$.

What is the value of a ?

You want to get all the denominators to be the same, $(x+2)^2$

Multiply the last term
By $(x+2)/(x+2)$

$$\frac{a}{(x+2)^2} = \frac{2x+6}{(x+2)^2} - \frac{2(x+2)}{(x+2)^2}$$

Get rid of the () in the numerator

$$\frac{a}{(x+2)^2} = \frac{2x+6}{(x+2)^2} - \frac{2x+4}{(x+2)^2}$$
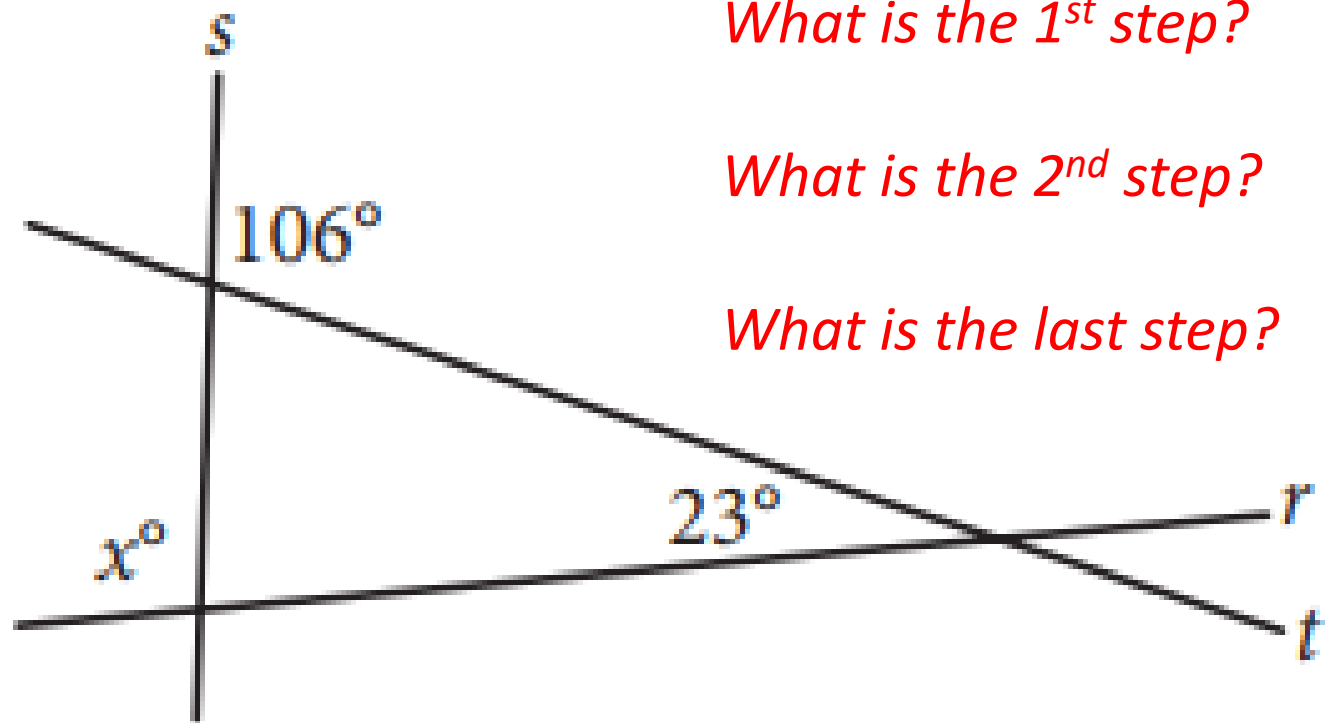
Add the numerators since the denominators are the same

$$\frac{a}{(x+2)^2} = \frac{2x+6-2x-4}{(x+2)^2} = \frac{2}{(x+2)^2}$$

$$a = 2$$

20

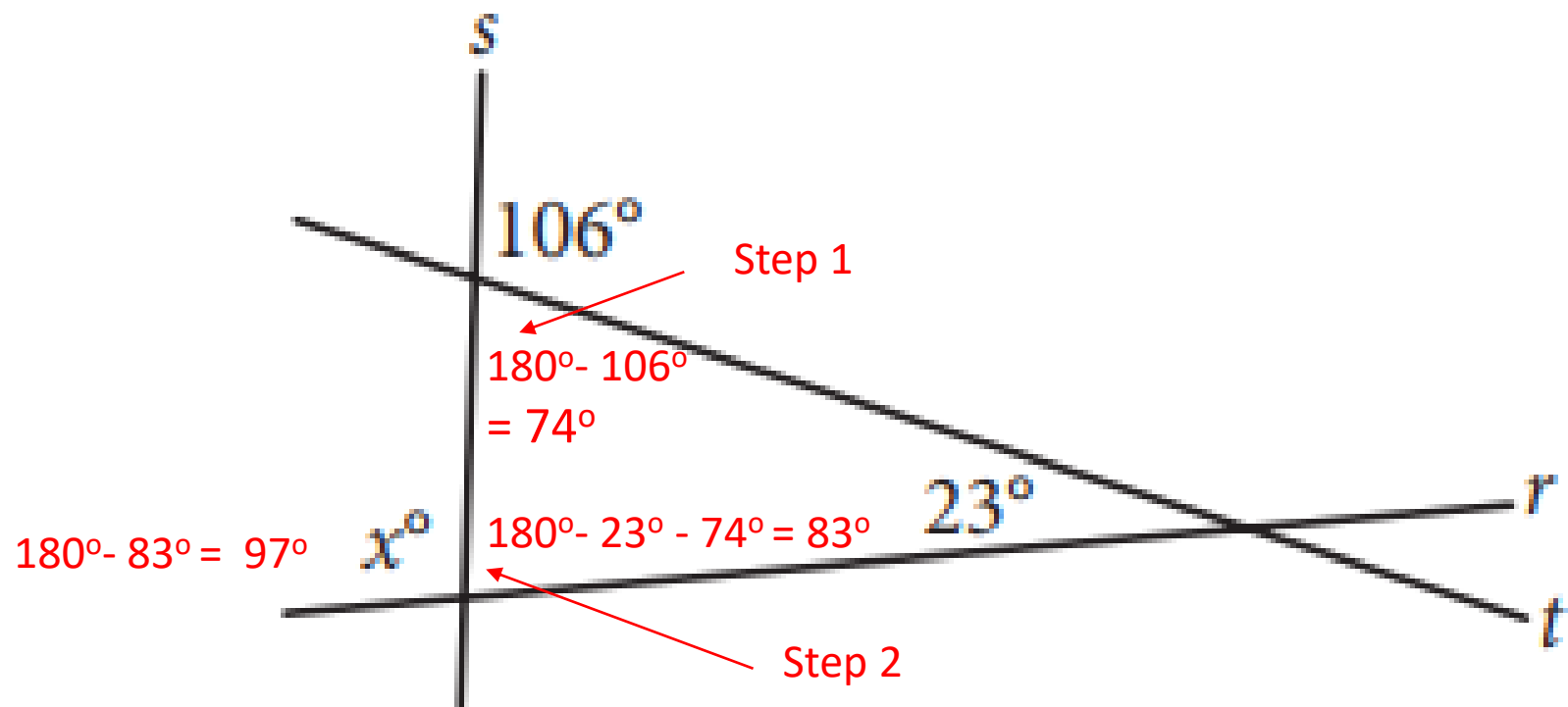Intersecting lines r, s, and t are shown below.

What is the 1st step?

What is the 2nd step?

What is the last step?

What is the value of x ?

20

Intersecting lines r, s, and t are shown below.

s

$106°$

Step 1

$180° - 106°$
$= 74°$

$180° - 83° = 97°$ $x°$ $180° - 23° - 74° = 83°$ $23°$ r

t

Step 2

What is the value of x ?