Assessment test for those considering Math 120

Instructions for working the problems:

- You should allow yourself 90 minutes to solve the problems.
- Ideally, you should plan to work the problems in one session while focused exclusively on the test problems.
- Do not use graphing tools your calculator might provide. In Math 120, only non-graphing calculators are allowed, so create the same testing situation for yourself.
- Turn off all screens so you can focus and so that this will be a true indication of what you can do.
- Keep a record of your results so that you can easily find the problems you did solve and those you did not.
- If you do not get the correct answer on the first try, check your work and look for errors, or start again with perhaps a different method.

If you can complete all problems correctly, you have the kind of preparation necessary to do well in Math 120.

1. Fifteen years ago, a person was half as old as they will be five years from now. How old are they now?

2. Starting today, the height of a certain tree will increase by 3% each year for the next six years, and then decrease by 5% over the following year. Compared to today, how tall will the tree be seven years from now?

3. Find the equation of the line which passes through the points $(1, 3)$ and $(-2, -5)$.

4. Find the equation of the line which passes through the point $(3, 5)$ and is perpendicular to the line with equation $2x - 3y = 5$.

5. Find the solution to the following pair of equations:

$$\begin{aligned} 3x + 4y &= 8 \\ 2x - 5y &= 10 \end{aligned}$$

6. Find all solutions to the equation $3x^2 + 5x = 2$.

7. Find all solutions to the equation $(3x + 1)(x + 2) - x(x - 3) = x^2 + 5$.

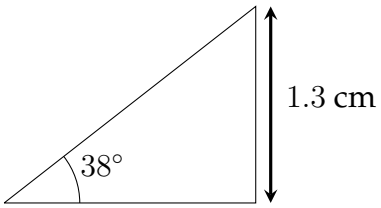
8. Find all solutions to the equation $3 = \dfrac{1}{x} + \dfrac{2}{x - 5}$.

9. Find all solutions to the equation $|3x + 4| = 22$.

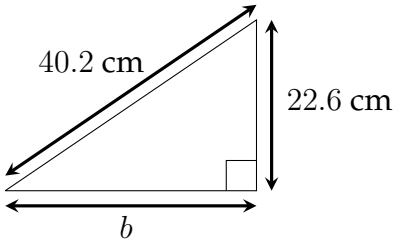
10. Solve the inequality: $14 - 3x < 6 + x$.

11. How many values of x are there such that $\sin x = -0.22$ and $-\frac{\pi}{2} \leq x \leq 4\pi$?

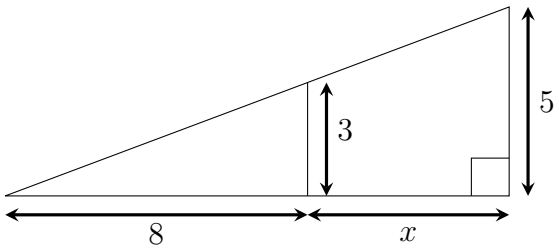
12. How long is the hypotenuse of the right triangle shown below?



13. Find the length b in the figure below.



14. Find the unknown length x in the figure below.

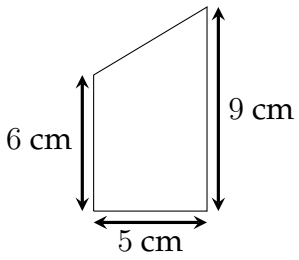


15. Suppose $f(x) = 4x + 5$. Find all solutions to the equation $f(x + 3) = 2f(2x)$.

16. Suppose $g(x) = x^2 - x$. Find all solutions to the equation $g(2x) = 3g(x + 1)$.

17. What is the area of the triangle in the xy-plane with vertices $(-5, -3)$, $(3, 7)$ and $(10, -3)$?

18. What is the area of the trapezoid shown below?



Answers

1. 35 years old
2. $\approx 13.43\%$ taller
3. $y = \frac{8}{3}x + \frac{1}{3}$
4. $y = -\frac{3}{2}(x-3) + 5$
5. $x = \frac{80}{23}, y = -\frac{14}{23}$
6. $x = -2, x = \frac{1}{3}$
7. $x = -5 \pm \sqrt{28}$
8. $x = 3 \pm \frac{\sqrt{66}}{3}$
9. $x = 6$ and $x = \frac{-26}{3}$
10. $x > 2$
11. five
12. ≈ 2.1116 cm
13. ≈ 33.246 cm
14. $x = \frac{16}{3}$
15. $x = \frac{7}{12}$
16. $x = 0$ and $x = 5$
17. 75 square units
18. 37.5 cm^2