

Pre-BC Topics Problems

1. Perform the partial fraction decomposition to solve for the capital-letter variables:

$$(a) \frac{8x - 5}{x^2 - x} = \frac{A}{x - 1} + \frac{B}{x}$$

$$(b) \frac{x^2 + 2x - 1}{x^2 - 1} = 1 + \frac{C}{x - 1} + \frac{D}{x + 1}$$

$$(c) \frac{2x^2 + x + 9}{x^2 - x - 6} = 2 + \frac{E}{x - 3} + \frac{F}{x + 2}$$

2. The first term of an arithmetic sequence is 7. Given that the sum of the fourth and fifth term is 42, find the sixth term.

3. Ana is trying to increase the amount of exercise she does every day. On the first day she walks a mile. On the second day she walks 1.5 miles. On her k^{th} day, she walks $0.5(k + 1)$ miles. How many days will it take for her to have walked at least 100 miles in total?

4. Given that the second term of a geometric sequence is 18, and the fourth term is $\frac{81}{2}$, find the sum of the first three terms.

5. Determine the value of the following:

(a) The sum of the first six terms of an arithmetic sequence with $a_2 = 7$ and $a_7 = 22$.

(b) The sum of the first four terms of a geometric sequence with $a_1 = 5$ and common ratio $r = 3$.

(c) The sum of the infinite geometric series $20 + \frac{40}{3} + \frac{80}{9} + \frac{160}{27} + \dots$

6. Inflation in a certain city is rampant, and prices increase by 10% every day. Alex buys bread every day, but is worried he'll run out of money. Given that the price of bread is \$5 on day one, determine on which day Alex will spend more than \$100 in total.

7. Convert the following Cartesian coordinates to polar coordinates:

(a) $(\sqrt{2}, \sqrt{2})$

(b) $(-500, 500\sqrt{3})$

$$(c) \left(\frac{17\sqrt{3}}{2}, -\frac{17}{2} \right)$$

8. Convert the following polar coordinates to Cartesian coordinates:

$$(a) (5, 120^\circ)$$

$$(b) (3\sqrt{2}, \frac{\pi}{4})$$

$$(c) \left(6, \frac{4\pi}{3} \right)$$

9. Convert the equation $(x - 1)^2 + (y - 3)^2 = 4$ into polar form.

10. Convert the equation $r^2 + 4r \cos \theta + 6r \sin \theta - 3 = 0$ into the equation of a circle.

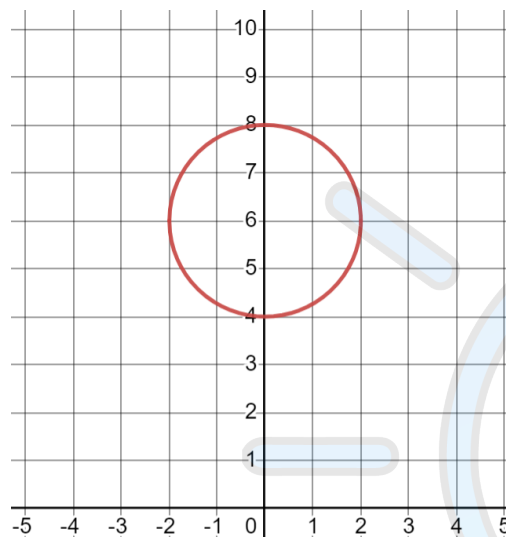
11. Convert the following equations into parametric form:

$$(a) 4x + 2y = 8$$

$$(b) (x - 5)^2 + (y + 3)^2 = 16$$

$$(c) \frac{x^2}{4} + \frac{y^2}{9} = 25$$

12. Write the equation of the circle below in parametric form:



13. A particle moves on a circle of radius 2 cm, centered at $(3, 4)$. At time $t = 0$, the particle starts at the point $(5, 4)$, and travels counterclockwise around the entire circle in 10 seconds. Determine the parametric equations for the location of the particle.

14. Given that $\vec{x} = \langle 5, -3 \rangle$, and $\vec{y} = \langle 6, 10 \rangle$, compute:

(a) $-\vec{x} + 4\vec{y}$

(b) $2\vec{x} - (\vec{y} + \langle 2, 7 \rangle)$

(c) $\vec{x} \cdot \vec{y}$

(d) The vector parallel to \vec{x} with a magnitude of 8.

15. A force of 100N is applied at a 30° angle above the horizontal on a box. Similarly, a force of 150N is applied but at a 150° angle above the horizontal. see diagram. Find the magnitude of the resultant force exerted on the box.

