1. $75^\circ\left(\frac{\pi \text{rad}}{180^\circ}\right) = \frac{5\pi}{12}$ So the solution is B.

2. In the figure, the measures of the angles are given in degrees. What is the measure of angle C?

$$45^\circ + 60^\circ + b = 180^\circ$$
$$b = 75^\circ$$
$$75^\circ + C = 180^\circ$$
$$C = 105^\circ$$

So the answer is E.

3. $z^2 + 144 = 0$

$$z^2 = -144$$
$$z = \pm 12$$

Answer is B.

4. $\sqrt{25x^{14}6y - 25y^{14}}$

$$= \sqrt{25y^{14}(x^6 - 1)}$$
$$= 5y\sqrt{x^6 - 1}$$

Answer is B.

5. $(-27a^{12}b^3c^{-6})^{\frac{1}{3}}$

$$= (-27)^{\frac{1}{3}}a^{\frac{12}{3}}b^{\frac{3}{3}}c^{\frac{-6}{3}}$$
$$= -3a^4b^1c^{-2}$$
$$= \frac{-3a^4b}{c^2}$$

Answer is D.

6. $(\frac{x^2-4x-5}{x^2-49}) \div (\frac{2x+2}{7-x}) =$

$$\frac{(x-5)(x+1)}{(x-7)(x+7)} * \frac{-(x-7)}{2(x+1)}$$
$$= \frac{-(x-5)}{2(x+7)}$$

Answer is C.

7. $tan\theta = \frac{12}{5}, 0 \leq \theta \leq \frac{\pi}{2}$

$$\tan\theta = \frac{opposite}{adjacent} = \frac{a}{b}$$
$$a^2 + b^2 = c^2 \Rightarrow (12)^2 + (5)^2 = c^2 \Rightarrow c^2 = 169 \Rightarrow c = 13$$
$$\sec\theta = \frac{hypotenuse}{adjacent} = \frac{c}{b} = \frac{13}{5}$$

Answer is B.

8. By completing the square, $x^2 + 26x - 6 =$

$$x^2 + 26x - 6 = 0 \Rightarrow x^2 + 26x = 6$$

$$(x^2 + 26x) + 13^2 = 6 + 13^2$$

$$x^2 + 26x + 169 = 6 + 169$$

$$x^2 + 26x - 175 = 0$$

Answer is A.

9. Find the distance between the points (3,8) and (-8,-1)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(-8 - 3)^2 + (-1 - 8)^2}$$

$$d = \sqrt{(-11)^2 + (-9)^2}$$

$$d = \sqrt{121 + 81}$$

$$d = \sqrt{202}$$

Answer is A.

10. simplify

$$\frac{\frac{1}{x-13} + \frac{17}{(x-13)^2}}{x+1} = \frac{1}{(x-13)(x+1)} + \frac{17}{(x-13)^2(x+1)}$$

$$= \frac{x - 13 + 17}{(x-13)^2(x+1)}$$

$$= \frac{x+4}{(x-13)^2(x+1)}$$

Answer is E

11. Angle ABC in the figure to the right is a right angle. What is x? $\overline{AB}^2 = x^2 + 5^2$ and $\overline{BC}^2 = x^2 + 85^2$ Then

$$B^2 = \overline{AC} = \overline{AB}^2 + \overline{BC}^2$$

$$169 = (x^2 + 25) + (x^2 + 64)$$

$$169 = 2x^2 + 89$$

$$80 = 2x^2$$

$$40 = x^2$$

$$x = \sqrt{40}$$

Answer is C

12. Lines l_1 and l_2 are parallel. Line l_3 is perpendicular to l_2. Which of the following is NOT true. We can do this drawing the lines and testing each option. Answer is C

13. To determine if a value is a root of the polynomial, we must evaluate the polynomial at that value and if the evaluation comes to be zero we in fact have a root. Since the questions asks us, what is <u>NOT</u> a root we must find out for which value does the polynomial evaluate not to be zero. A hint is to start with the easiest numbers, say $x = -1$. Thus we have

$$\begin{aligned} x^4 - 7x^3 - 4x^2 + 52x + 48 &= (-1)^4 - 7(-1)^3 - 4(-1)^2 + 52(-1) + 48 \\ &= 1 + 7 - 4 - 52 + 48 \\ &= 0 \end{aligned}$$

Since the polynomial evaluates to 0, $x = -1$ is a root. Next let's try $x = 1$

$$\begin{aligned} x^4 - 7x^3 - 4x^2 + 52x + 48 &= (1)^4 - 7(1)^3 - 4(1)^2 + 52(1) + 48 \\ &= 1 - 7 - 4 + 52 + 48 \\ &= 90 \end{aligned}$$

Since the polynomial does not evaluate to zero we do not have a root, and thus the solution is D.

14. What is the length of BC

$$cotx = \frac{BC}{10}$$

Solving for BC gives

$$BC = 10 * cotx$$

So the answer is C.

15. $\log_c b = 9$ means

$$c^9 = b \text{ by log properties}$$

So the answer is C.

16. The inequality $x^2 - 10x < -21$ is equivalent to which of the following?

$$\begin{aligned} x^2 - 10x &< -21 \\ x^2 - 10x + 21 &< 0 \end{aligned}$$

By considering $x^2 - 10x + 21 = 0$ we solve by factoring in which we get $(x - 7)(x - 3)$. Thus we have that $x = 7$ and $x = 3$. Now considering it on a number line we see that for $x < 3$ is positive, $3 < x < 7$ is negative, and $x > 7$ is positive. So when we have $x^2 - 10x + 21 < 0$, we get $3 < x < 7$. Hence the answer is E.

17. The point $(-2, 7)$ is reflected across the y-axis, shifted down 3 units, then reflected across the line $y = x$. What are the coordinates of the resulting point?

    Since the point $(-2, 7)$ is being reflected across the y-axis, the x term becomes positive, and now we are at $(2, 7)$. Then it is shifted down so we have $(2, 4)$. Now reflecting over $y = x$ line, the x and y change place and we have $(4, 2)$, which corresponds to the answer D.

18. In the trapezoid to the right, AB is parallel to CD and perpendicular to BC. If the area of the trapezoid is 126, what is the length BC?

    Since the area of the trapezoid is given by

$$Area = \frac{1}{2}(AB + CD)\,BC$$

    Now plugging in the values that we know we have

$$\begin{aligned} 126 &= \frac{1}{2}(15 + 13)\,BC \\ 252 &= 28BC \\ BC &= 9 \end{aligned}$$

    This corresponds to the solution E.

19. Considering the problem

$$\begin{aligned} \frac{\sqrt[3]{64x}}{\sqrt{64x}} &= \frac{4\sqrt[3]{x}}{8\sqrt{x}} \\ &= \frac{x^{1/3}x^{-1/2}}{2} \\ &= \frac{x^{-1/6}}{2} \\ &= \frac{1}{2\sqrt[6]{x}} \end{aligned}$$

    Which corresponds to the answer E.

20. In the figure to the right, AB si the diameter of the circle with center O. If the length of OC is 15 and the length of BC is 24, what is the length of AC?

    ABC is a right triangle since AB is the diameter of the circle with center O. This implies that we have

$$\begin{aligned} OC &= \frac{1}{2}AB \\ AB &= 2OC \\ AB &= 30 \end{aligned}$$

Now using the Pythagorean theorem we have

$$\begin{aligned} AC^2 + BC^2 &= AB^2 \\ AC &= \sqrt{AB^2 - BC^2} \\ AC &= \sqrt{30^2 - 24^2} \\ AC &= \sqrt{324} \\ AC &= 18 \end{aligned}$$

Answer is A

21. Simplify

$$\begin{aligned} \frac{x^5y}{(4x^{-1}y^2)^{-4}} &= \frac{x^5y}{4^{-4}x^{-1*-4}y^{2*-4}} \\ &= \frac{x^5y}{\frac{1}{256}x^4y^{-8}} \\ &= \frac{256xy}{y^{-8}} \\ &= 256xy^9 \end{aligned}$$

So the answer is D.

22. The absolute value inequality $\left|\frac{6-x}{4}\right| > 5$ is equivalent to: We need to use absolute value properties, thus we have

$$\frac{6-x}{4} > 5$$

or

$$\frac{6-x}{4} < -5$$

Solving for x on both equations we get $x > 26$ or $x < -14$ Using test points x such that $x > 26$ or $x < -14$ and plugging them into$\left|\frac{6-x}{4}\right| > 5$. We get the values of x must be $\frac{6-x}{4} > 5$ or

$$\frac{6-x}{4} < -5$$

Answer is A.

23. If $log_5(x+13) = 2log_5 7$ then $x =$ Using logarithmic rules,

$$\begin{aligned} log_5(x+13) &= log_5 7^2 \\ log_5(x+13) &= log_5 49 \\ x + 13 &= 49 \\ x &= 36 \end{aligned}$$

Answer is B

24. If $f(x) = |x|$ and $g(x) = x^3 - 5x - 6$, then $(f \circ g)(-2) =$?

Since we have that $(f \circ g)(x) = |x^3 - 5x - 6|$, by plugging in -2 we have

$$(f \circ g)(-2) = \left|(-2)^3 - 5(-2) - 6\right| = |-4| = 4$$

This solution corresponds to C.

25. One root of $9x^2 - 3x - 4$ is Using the root formula with $a = 9$, $b = -3$, and $c = -4$ we have

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(9)(-4)}}{2(9)} \\ &= \frac{3 \pm \sqrt{153}}{18} \end{aligned}$$

Which corresponds to the solution D.

26. Leslie is in the center of a circular track of radius 60 feet watching Katrina and Jensine run a race. When Katrina wins, Leslie notices that the angle formed by drawing a line from the center of the track to Katrina and a line from the center of the track to Jensine measure $\frac{\pi}{4}$ radians. How far, in feet, behind Katrina is Jensine when Katrina wins?

If one were to draw this situation out we can notice that we have an interior angle about the center of the circle in which there is a secant line connecting the two racers. With a radius of 60 feet, we have an isosceles triangle. Using geometry we get the equation of the arc length to be

$$x = \sqrt{60^2 + 60^2 - 2(60)(60)\cos(\frac{\pi}{4})} = 15\pi$$

This corresponds to the solution B.

27. In the triangle ABC to the right, the length of AB is equal to the length of BC. What is x?

Note that since AB = BC, we have that $\angle C = \angle A = 45°$. The using the fact that the interior angle of a triangle sum to 180 we have that

$$\begin{aligned} 15° + 15° + 8x° &= 180° \\ 30° + 8x° &= 180° \\ 8x° &= 150° \\ x &= \frac{75°}{4} \end{aligned}$$

Thus the answer is B.

28. If $\log_9(x^2 - 28) - \log_9(x) = \frac{1}{2}$, then $x = ?$.

Using the properties of log, we have that

$$\begin{aligned} \log_9(x^2 - 28) - \log_9(x) &= \frac{1}{2} \\ \log_9\left(\frac{x^2 - 28}{x}\right) &= \frac{1}{2} \end{aligned}$$

Raising both sides to 9 to get rid of the log we get that

$$\begin{aligned} 9^{\log_9\left(\frac{x^2-28}{x}\right)} &= 9^{\frac{1}{2}} \\ \frac{x^2 - 28}{x} &= 3 \\ x^2 - 28 &= 3x \\ x^2 - 3x - 28 &= 0 \\ (x-7)(x+4) &= 0 \end{aligned}$$

So we have $x = 7$ and $x = -4$. However if $x = -4$ we have we would have to take log of a negative number which is impossible, thus the only solution is $x = 7$, which is B.

29. Leslie has a square garden plot of area A square feet. If she decides to expand her garden by doubling the length of each side, what is the area of her new garden? The side of the square will be $\sqrt{A}$ and a new garden has double. Thus we have $2\sqrt{A}$. Now we square $2\sqrt{A}$ thus we get $4A$ Answer is D.

30. By simplifying we have that

$$\begin{aligned} 4^{(x)} \cdot 4^{(x+15)} &= 64^{(x-\frac{4}{3})} \\ 4^{(x+x+15)} &= 4^{3(x-\frac{4}{3})} \\ 4^{(2x+15)} &= 4^{(3x-4)} \\ \implies 2x + 15 &= 3x - 4 \\ x &= 19 \end{aligned}$$

This corresponds to the solution C.

31. A store has a 50-inch TV on sale. This distance is the diagonal distance across the screen. The ratio of the base of the screen to the height is 4/3. What is the length of the base of the screen?

$$\frac{base}{height} = \frac{4}{3}$$

$$b = \frac{4h}{3}$$
$$50^2 = b^2 + h^2$$
$$2500 = (\frac{4h}{3})^2 + h^2$$
$$2500 = \frac{16h^2}{9} + h^2$$

Solving for h

$$h = 30$$

Plug h back into $b = \frac{4h}{3}$ to solve for b

$$b = \frac{4 * 30}{3} = 40$$
$$b = 40$$

Answer is D.

32. By simplifying we have that

$$\begin{aligned}
\frac{x}{x+11y} + \frac{13y}{x-11y} &= \frac{x}{x+11y} \cdot \frac{(x-11y)}{(x-11y)} + \frac{13y}{x-11y} \cdot \frac{(x+11y)}{(x+11y)} \\
&= \frac{x(x-11y)}{(x+11y)(x-11y)} + \frac{13y(x+11y)}{(x+11y)(x-11y)} \\
&= \frac{x^2 - 11xy + 13xy + 143y^2}{(x+11y)(x-11y)} \\
&= \frac{x^2 + 2xy + 143y^2}{x^2 - 121y^2}
\end{aligned}$$

Answer is E.

33. By simplifying we have that

$$\log_3 x - \log_3 (x+2) = \log_3 15$$
$$\log_3 \left(\frac{x}{x+2}\right) = log_3 15$$
$$\implies \frac{x}{(x+2)} = 15$$
$$x = 15x + 30$$
$$x = \frac{-15}{7}$$

But since x cannot be negative thus we have no solution. Answer is E

34. The equation of the line that is parallel to the line $y = \frac{4}{5}x - 2$ and contains the point (5,-2) is:
Since the slope is the same for parallel thus $m = \frac{4}{5}$ Using the point-slope formula: $y - y_0 = m(x - x_0)$ we plug our point (5,-2) and $m = \frac{4}{5}$

$$y - y_0 = m(x - x_0)$$

$$y - (-2) = \frac{4}{5}(x - 5)$$

$$y + 2 = \frac{4}{5}(x - 5)$$

$$y + 2 = \frac{4}{5}x - 4$$

$$y = \frac{4}{5}x - 6$$

Answer is B

35. if $f(x) = \sqrt{-6x + 30}$ then $f(-3 + h) =$

$$f(-3 + h) = \sqrt{-6(-3 + h) + 30}$$

$$f(-3 + h) = \sqrt{18 - 6h + 30}$$

$$f(-3 + h) = \sqrt{-6h + 48}$$

Answer is E

36. The figure to the right is composed of three congruent squares. If the total area of the figure is 75, find the perimeter.
Since the total area for three squares is 75 implies the area for one square is $\frac{75}{3} = 25$
Length of 1 side is $\sqrt{25} = 5$ since the area of a square is $A = s^2$ where s is the side of the square. Now the perimeter of a square is $4s$ and since $s = 5$ thus the perimeter is $4 * 5 = 20$ Now the perimeter of 3 squares is $20 * 3 = 60$

Answer is A.