Detailed Solutions for Unilearn Mathematics Questions

The following Feedback Booklet will help determine what knowledge and skill you may be lacking prior to enrolling in any of the Unilearn maths.

	To view the answers in an easy to read format make sure that you have the bookmark icon clicked on your feedback document sidebar.

The feedback is resented in the following format:

1. **Original questions**
2. **Step-by-step solution guide for each question**
3. **Review topics to guide you when looking online or in math textbooks**

The following Internet links may be helpful to you

http://www.math.com/students/homeworkhelp.html#algebra
http://www.sosmath.com/algebra/algebra.html
http://mathworld.wolfram.com/topics/Algebra.html
http://www.purplemath.com/modules/index.htm

The following links provide access to graphing or scientific calculators to help you solve your math equations. These calculators are free.

Graphing Calculators

http://my.hrw.com/math06_07/nsmedia/tools/Graph_Calculator/graphCalc.html
http://gcalc.net/

Scientific Calculators

http://www.motionnet.com/calculator/
http://freeonlinecalculator.net/scientific.htm

Question 1

$\frac{2\sqrt{12^2}-(\sqrt{12})^2}{\sqrt{5}}$ Is the original problem

First, simplify the top square roots, (Review square rules)

Now $\sqrt{12^2}$ = 12 and $(\sqrt{12})^2$ = 12

Substitute those answers back into the original equation

$\frac{2\times12-12}{\sqrt{5}}$ = $\frac{12}{\sqrt{5}}$ but we are not done yet,

The last step is <u>rationalising the denominator</u>

$\frac{12}{\sqrt{5}}$ can be written as $\frac{12\times\sqrt{5}}{\sqrt{5}\times\sqrt{5}}$ = $\frac{12\sqrt{5}}{5}$

The answer is **C**

Question 2

$\frac{a}{b-c}-1$ Is the original problem

First you need to get the same denominator for both parts of the expression.

Write 1 as $\frac{b-c}{b-c}$ and substitute back into the original equation for 1

You now have $\frac{a}{b-c}-\frac{b-c}{b-c}$ with both parts having the same denominator.

We can now simply write the expression as $\frac{a-(b-c)}{b-c}$

Note that the bracket is ***essential*** at this stage.

We now need to remove the bracket by distributing the – (minus) sign to the variables within the bracket (remember that the – outside the brackets changes the sings inside the bracket). (Review algebraic signs)

The simplified version of the equation becomes $\frac{a-b+c}{b-c}$

The answer is **D**

Question 3

$\frac{(4^2)^{-1} \times 2^{-3}}{2^0 \times 4^{-3}}$ Is the original problem

We will use the laws of indices noting that (Review laws of indices)

$2^0 = 1$, $4 = 2^2$, and $2^{-3} = \frac{1}{2^3}$

First we will simplify the bracket portion of the equation

$(4^2)^{-1} = 4^{-2} = (2^2)^{-2} = 2^{-4}$

Now we will substitute this for the first numerator terms and then simplify

$2^{-4} \times 2^{-3} = 2^{-7}$

Now we will simplify the denominator

$1 \times (2^2)^{-3} = 2^{-6}$

Now we will substitute the simplified versions of the numerator and denominator into the equation

$\frac{2^{-7}}{2^{-6}}$ We will now simplify so that the equation is stated with positive indices

$\frac{2^6}{2^7}$ and then we will simplify to $\frac{1}{2}$

Note: Remember that 2^6 is the same as writing 2 x 2 x 2 x 2 x 2 x 2. So when you simplify you cancel out all but one 2 on the bottom leaving $\frac{1}{2}$.

The answer if **B**

Question 4

Three members of a group are absent. If the absent members represent 12 $\frac{1}{2}$ % of the group, how many are in the group? Is the original problem

Let the number of members in the group be N, so 12 $\frac{1}{2}$ % of N = 3

Write 12 $\frac{1}{2}$ % as a fraction, $\frac{12.5}{100} \times N = 3$

(100 represents 100 % of the group members)

We now need to rearrange the equation so we are solving for N

We multiply both sides by 100 to remove the denominator

$100 \times \frac{12.5}{100} \times N = 3 \times 100$ to get $12.5 \times N = 3 \times 100$

(the 100s cancel each other out)

We multiple both sides by 1/12.5 in order to get N by itself

$\frac{1}{12.5} \times 12.5 \times N = 3 \times 100 \times \frac{1}{12.5}$ we get $N = \frac{3 \times 100}{12.5} = 24$

(the 12.5s cancel each other out)

So there are 24 members in the group

The answer is B

Question 5

$\frac{a^4b^{-2}}{4a^{-2}b} \div \frac{b^{-1}}{8a^2}$ Is the original problem

We do the division first by inverting the second fraction and changing the sign to multiplication, then multiple the terms (remember to add or subtract powers when you multiply terms. The power b is the same as b^1) (Review exponential algebra rules)

$\frac{a^4b^{-2}}{4a^{-2}b} \times \frac{8a^2}{b^{-1}} = \frac{8a^6b^{-2}}{4a^{-2}b^0}$ Now we need to get rid of the negative indices by moving them to the top or bottom of the fraction and dividing the whole numbers if possible. Then collect like terms.

$\frac{2a^6 \times a^2}{b^0 \times b^2} = \frac{2a^8}{b^2}$ we can further simplify the answer = $2\left(\frac{a^4}{b}\right)^2$

The answer is A

Question 6

If log3 = x and y=log5 then log45 is? Is the original problem

Now log45 = log(5 x 9)

Which is log5 + log9 but 9 is the same as 3^2
So log 9 = $\log 3^2$ we can rewrite this as 2 log3 (review log exponential identities)

So log45 = log5 + 2 log3. we can now substitute in x and y to give

log45 = y + 2x

The answer is A

Question 7

If $\log_a N^2 = b$ then N is? Is the original problem

From the definition of a logarithm we can rewrite the equation as (review logarithm relationship)

$a^b = N^2$. We now need to isolate N so we can solve for N

We take the square root of both sides and get N = $\sqrt{a^b}$. Now we rewrite the square root as follows (Review square root rules)

$(a^b)^{\frac{1}{2}}$ this is simplified to $a^{\frac{b}{2}}$

The answer is D

Question 8

Find the value of x so that $\frac{2x-1}{3}+\frac{x}{6}=1$ Is the original problem

First we clear the fraction by multiplying all terms by the lowest common denominator, which is 6

$6\left(\frac{2x-1}{3}\right)+6\left(\frac{x}{6}\right)=1\times 6$ this now becomes $2(2x-1)+x=6$

We now multiply the bracketed term to get $4x-2+x=6$

Now we collect like terms $5x-2=6$ add 2 to each side $5x-2+2=6+2$ and now we have $5x=8$. Now we divide both sides by 5 in order to solve for x

$\frac{5x}{5}=\frac{8}{5}$ and we get x = $\frac{8}{5}$

The answer is A

Question 9

A straight line passes through points (0,4) and (3,0). The equation of the line is? Is the original problem

The equation of a straight line can be written as y = ax + b were x and y are the independent variable and dependent variable respectively, and *a* and *b* are numbers to be found. (Review linear equations)

We can substitute (0,4) into the equation and get 4 = 0a + b this means b = 4

The new equation now reads y = ax + 4

We can substitute (3,0) into this equation and get 0 = 3a + 4 and solve for a

Subtract 4 from both sides and you get -4 = 3a now divide both sides by 3 and you get a = $-\frac{4}{3}$ now substitute the values of a and b back into the original equation

y = $-\frac{4}{3}$x + 4. We now simplify the equation by removing the fraction. Multiply both sides by 3.

$3\times y = 3\left(-\frac{4}{3}x\right) + 4\times 3$ we get 3y = -4x + 12 we now need to set the whole equation equal to 0 for the final answer. We move -4x + 12 to the other side and change their signs. This is 3y + 4x – 12 = 0

The answer is C

Question 10

If $f(x) = x^2 - \frac{1}{x} + 2$ the $f(-a)$ is? Is the original problem

We substitute –a for x in $f(x)$ and get $f(-a) = (-a)^2 - \frac{1}{-a} + 2$

(Review algebraic functions)

We get rid of the – signs because a square always give a positive number whether the number is negative or positive and the minus sign and –a in the fraction cancel each other out using the rules of signs. (Review rules of signs)

The result is $a^2 + \frac{1}{a} + 2$

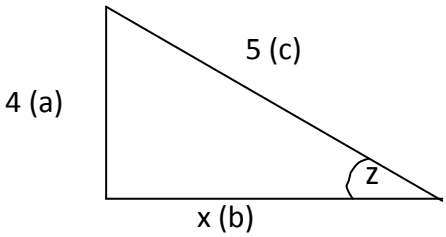
The answer is D

Question 11

If $\sin z = \frac{4}{5}$ and 0 < z < 90°, then $\tan z$ is? Is the original problem

We construct a right triangle with $\sin z = \frac{4}{5}$ (Review Trig. Ratios)

sin z = $\frac{a}{c} = \frac{opposite}{hypotenuse}$



Pythagoras's theorem states that $a^2 + b^2 = c^2$ we can use this to solve for b or x in our problem (Review Pythagoras Theorem)

$4^2 + x^2 = 5^2$ or $16 + x^2 = 25$ isolate b so that $x^2 = 25 - 16 = 9$

$x^2 = 9$ so x = 3

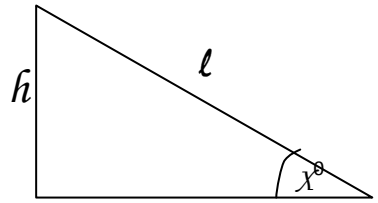
We now need to solve for tan z = $\frac{Opposite}{Adjacent} = \frac{a}{b} = \frac{4}{3}$

The answer is C

Question 12

A ladder, ℓ meters long, leans against a vertical wall. The angle between the ladder and the horizontal ground is x degrees. The distance that the ladder reaches up the wall is given by? Is the original problem

We construct a diagram which is a right triangle. Let the height the ladder reaches up the wall be h and the length of the ladder be ℓ.



Ground

Using sin x we can construct a trig ratio of the sides of the triangle as

$\sin x = \frac{opposite}{hypotenuse} = \frac{h}{l}$

$\sin x = \frac{h}{l}$ we now multiply both sides by ℓ in order to isolate h so we get $h = \ell \sin x$
(Review Trig. Ratios)

The answer is C