MAT0511 ASSIGNMENT ONE 2019

Question 1

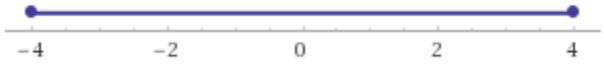
$P = (-3\,, 4]$ $Q = \{x \in R\colon\ -4 \leq x < 0\}$

A.

P

Q

$P \cup Q = [-4\,, 4]$



A is true

B.

P

Q

$P \cap Q = (-3\,, 0)$ $AND\ P \cup Q = [-4\,, 4]$

$P \cap Q \subset P \cup Q$

B is true

$C.$

$P \cap Q = (-3\,,0)$

$-4 < -3$

$-4 \notin P \cap Q$

$C\ is\ NOT\ true.$

$FIVE$

$\underline{Question\ 2}$

$A.$

$0,\dot{3} = 0{,}333\ldots = ??$

$Let\ x = 0{,}333\ldots$

$10x = 10 \times 0{,}333\ldots$

$10x = 3{,}333\ldots$

$x = 0{,}333\ldots$

$10x - x = 3{,}000\ldots$

$9x = 3$

$x = \frac{3}{9}$

$x = \frac{1}{3}$

$A\ is\ not\ true.$

$B. \quad -\frac{2}{3} < -\frac{3}{4}$????

$LCM(3\,,4) = 12$

$-\frac{2}{3} = -\frac{2\times4}{3\times4} \qquad AND\ -\frac{3}{4} = -\frac{3\times3}{4\times3}$

$-\frac{2}{3} = -\frac{8}{12} \qquad AND\ -\frac{3}{4} = -\frac{9}{12}$

$Now\ , 8 < 9$

$\therefore \quad \frac{8}{12} < \frac{9}{12}$

$\therefore \quad -\frac{8}{12} > -\frac{9}{12}$

$\therefore \quad -\frac{2}{3} > -\frac{3}{4}$

$B\ is\ NOT\ true.$

$C.\quad 0,\dot{3} > 0{,}3\ ????$

$0,\dot{3} = \frac{1}{3}\quad check\ Ques\ 2\ part\ A\ for\ a\ proof.$

$0{,}3 = \frac{3}{10}$

$LCM\ (3\ , 10) = 30$

$0,\dot{3} = \frac{1}{3}\quad AND\ 0{,}3 = \frac{3}{10}$

$0,\dot{3} = \frac{1 \times 10}{3 \times 10}\quad AND\ 0{,}3 = \frac{3 \times 3}{10 \times 3}$

$0,\dot{3} = \frac{10}{30}\quad AND\ 0{,}3 = \frac{9}{30}$

$Now, \qquad 10 > 9$

$\therefore \quad \frac{10}{30} > \frac{9}{30}$

$\therefore \quad \frac{1}{3} > \frac{3}{10}$

$\therefore \quad 0,\dot{3} > 0{,}3$

$C\ is\ true.$

$THREE$

Question 3

Difference between $-\frac{2}{5}$ *and* $\frac{1}{5}$ *is* $\frac{1}{5}-\left(-\frac{2}{5}\right)$

$$\frac{1}{5}-\left(-\frac{2}{5}\right)=\frac{1}{5}+\frac{2}{5}$$

$$\frac{1}{5}-\left(-\frac{2}{5}\right)=\frac{1+2}{5}$$

$$\frac{1}{5}-\left(-\frac{2}{5}\right)=\frac{3}{5}$$

TWO

Question 4

A. 0 *is a natural number ????*

Natural numbers $=\{1,2,3,4,\dots\}$

Whole numbers $=\{0,1,2,3,4,\dots\}$

A is NOT true.

B. $1{,}13 < 1{,}103$ *???*

Let $x = 1{,}13 \quad = 1{,}13000000000\ldots.$

Let $y = 1{,}103 = 1{,}10300000000\ldots$

The first two digits on x *and* y *are the same. The third digits are different.*

The third digit of x *is* 3 *and the third digit of* y *is* 0.

$3 > 0$

$\therefore x > y$

$\therefore\ 1{,}13 > 1{,}103$

B is NOT true.

$C.\ x < 0 \Rightarrow -x$ *is a positive number*???

Note, when an inequality is multiplied by negative number, the sign changes direction.

Given $x < 0$

Then $-1 \times x > -1 \times 0$

$\therefore -x > 0$

$\therefore -x$ *is a bigger than zero.*

$\therefore -x$ *is a positive number.*

C is true

THREE

Question 5

Patricia bought the following items so that she could make a dress:
$1\frac{3}{4}$*metres of material at* R48,00 *per metre.*

$$Cost\ of\ material = 1\frac{3}{4} \times R48{,}00$$

$$Cost\ of\ material = \frac{1 \times 4 + 3}{4} \times R48{,}00$$

$$Cost\ of\ material = \frac{7}{4} \times \frac{R48{,}00}{1}$$

$$\frac{48}{4} = \frac{24}{2}$$

$$\frac{48}{4} = \frac{12}{1}$$

$$\frac{48}{4} = 12$$

$$Cost\ of\ material = \frac{7}{1} \times \frac{R12{,}00}{1}$$

$$Cost\ of\ material = 7 \times R12{,}00$$

$$7 \times 10 = 70$$

$$7 \times 2 = 14$$

$$70 + 14 = 84$$

$Cost\ of\ material = R84{,}00$

$2\ reels\ of\ cotton\ at\ R7{,}99\ per\ reel.$

$Cost\ of\ cotton = 2 \times R7{,}99$

$2(7{,}99) = 2(8 - 0{,}01)$

$2(7{,}99) = 2 \times 8 - 2 \times 0{,}01$

$2(7{,}99) = 16 - 0{,}02$

$2(7{,}99) = 16{,}00 - 0{,}02$

$2(7{,}99) = 15{,}98$

$Cost\ of\ cotton = R15{,}98$

$8\ buttons\ at\ 79c\ per\ button.$

$Cost\ of\ buttons = 8 \times 79c$

$7^{7}\ 9 \qquad 8 \times 9 = 72$

$\times\ \ 8 \qquad 8 \times 7 = 56 \qquad 56 + 7 = 63$

$= 6\ 3\ 2$

$Cost\ of\ buttons = 632c$

$Cost\ of\ buttons = R\frac{632}{100}$

$Cost\ of\ buttons = R\frac{600 + 32}{100}$

$Cost\ of\ buttons = R6{,}32$

$Total\ cost = R84{,}00 + R15{,}98 + R6{,}32$

$R\ 0^{1}\ 8^{1}\ 4^{1}\ ,0^{1}\ 0$

$+R\ 0\ \ 1\ \ 5\ ,9\ \ 8$

$+R\ 0\ \ 0\ \ 6\ ,3\ \ 2$

$R\ \ 1\ \ 0\ \ 6\ ,3\ \ 0$

$Total\ cost = R106{,}30$

She paid for these items with two fifty rand notes and one twenty rand note.

$Amount\ paid = 2 \times R50 + 1 \times R20$

$Amount\ paid = R100 + R20$

$Amount\ paid = R120$

$Amount\ paid = R120{,}00$

$Change\ received = Amount\ paid\ \ minus\ \ Total\ cost$

$Change\ received = R120 - R106{,}30$

$Change\ received = R119 + R1 - R106{,}00 - R0{,}30$

$Change\ received = R119 - R106{,}00 + R1 - R0{,}30$

$Change\ received = R13 + R0{,}70$

$Change\ received = R13{,}70$

A is true.

B is NOT true. Her change is $R13{,}70$.

C The price of the material at the other shop is not given on the Tut letter.

Please check announcement on myUNISA or consult your lecture.

ONE or FOUR???

Question 6

Sam got $\frac{x}{40}$ *AND Japhta achieved* $\frac{y}{40}$

Japhta's mark exceeds Sam's mark by 20%. *Therefore* $y > x$. $y - x > 0$.

$20\%\ of\ 40 = \frac{20}{100} \times \frac{40}{1}$

$20\%\ of\ 40 = \frac{2}{1} \times \frac{4}{1}$

$20\%\ of\ 40 = 8$

$y - x = 8$

TWO

Question 7

$G = \{x \in N : x \geq 1\}$ $H = \{-3, -2, -1, 0, 1, 2\}$.

$G = \{1, 2, 3, 4, \ldots \ldots\}$ $H = \{-3, -2, -1, 0, 1, 2\}$.

$A.$ $G = [1, \infty)?????$

According to the above statement, $G = \{x \in R : x \geq 1\}$.

This includes decimal fractions which are not natural numbers.

A is NOT true.

$B.$ $G \cap H = \{1,2\}?????$

$G = \{1, 2, 3, 4, \ldots \ldots\}$ $H = \{-3, -2, -1, 0, 1, 2\}$.

$G \cap H$ *is the set that has elements that are both in* G *and in* H.

$G \cap H = \{1,2\}$

B is true

$C.$ $H \subseteq Z$ $?????$

$H = \{-3, -2, -1, 0, 1, 2\}$ $Z = \{\ldots \ldots \ldots, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, \ldots \ldots \ldots\}$

Note that all the elements that are in H *are also in* Z *as well.*

So $H \subseteq Z$.

C is true

FOUR

Question 8

A. The prime factors of 30 *are* 5 *and* 6???

A factor of 30 *is a number that leaves no reminder after* 30 *has been divided by it.*

A prime number is a number that has exactly two different factors.

Prime factors are those factors that are prime numbers.

The factors of 30 *are* 1, 2, 3, 5, 6, 10, 15 *and* 30.

The prime factors of 30 *are* 2, 3 *and* 5.

6 *is not a prime factor of* 30 *because* 6 *is not a prime number.*

A is NOT true.

B. The HCF of 14 *and* 28 *is* 14.????

A factor of n is a number that leaves no reminder after n has been divided by it.

The factors of 14 *are* 1, 2, 7 *and* 14.

The factors of 28 *are* 1, 2, 4, 7, 14 *and* 28.

The common factors of 14 *and* 28 *are* 1,2, 7 *and* 14.

The HCF of 14 *and* 28 *is the biggest number is a factor of both* 14 *and* 28.

The highest common factor of 14 *and* 28 *is* 14.

B is true.

C. The LCM of 2, 3 *and* 7 *is* 84.????

A multiple of n is a number that is divisible by n.

A multiple of n is a number that leaves no remainder after it is divided by n.

Some multiples of 2 *are* 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, ….

Some multiples of 3 *are* 3, 6, 9, 12, 15, 18, 21, 24, 27,30,33, 36, ….

Some multiples of 7 *are* 7, 14, 21, 28, 35, 42, 49, 56, … …

Some common multiples of 2, 3 *and* 7 *are* 42, 84, 126, 168, … … … ..

The lowest common multiple of $2, 3$ *and* 7 *is the smallest number that is divisible by all three numbers.*

The LCM of $2, 3$ *and* 7 *is* 42.

C *is false.*

Question 9

$A.$ $\frac{2}{5} = \frac{10}{25}$????

$$\frac{2}{5} = \frac{2 \times 5}{5 \times 5}$$

$$\frac{2}{5} = \frac{10}{25}$$

A *is true.*

$B.$ $\frac{2}{3} + \frac{3}{4} = \frac{5}{7}$??????

$LCM(3\,, 4) = 12$. *To make both denominators* 12.

$$\frac{2}{3} + \frac{3}{4} = \frac{2 \times 4}{3 \times 4} + \frac{3 \times 3}{4 \times 3}$$

$$\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12}$$

$$\frac{2}{3} + \frac{3}{4} = \frac{8 + 9}{12}$$

$$\frac{2}{3} + \frac{3}{4} = \frac{17}{12}$$

$$\frac{2}{3} + \frac{3}{4} = \frac{12 + 5}{12}$$

$$\frac{2}{3} + \frac{3}{4} = \frac{12}{12} + \frac{5}{12}$$

$$\frac{2}{3} + \frac{3}{4} = 1 + \frac{5}{12}$$

$$\frac{2}{3} + \frac{3}{4} = 1\frac{5}{12}$$

B *is NOT true.*

$C.\quad 1{,}256 \approx 1.3$ *correct to the nearest tenth.?????*

Consider $1{,}256$.

The units digit is 1.

The tenths digit is 2.

The hundredths digit is 5.

The thousandths digit is 6.

Consider $\{0, 1, 2, 3, 4\}$ *to be the set containing small numbers.*

Consider $\{5, 6, 7, 8, 9\}$ *to be the set containing big numbers.*

The first digit immediately to the right of 2 *is* 5.5 *is a big number.*

So $1{,}256 \approx 1.3$ *correct to the nearest tenth.*

C is true

FOUR

Question 10

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{3\sqrt{4\times5}-\sqrt{9\times5}+4\sqrt{25\times5}}{2\sqrt{3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{3\sqrt{4}\times\sqrt{5}-\sqrt{9}\times\sqrt{5}+4\sqrt{25}\times\sqrt{5}}{2\sqrt{3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{3\times2\times\sqrt{5}-3\times\sqrt{5}+4\times5\times\sqrt{5}}{2\sqrt{3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{6\sqrt{5}-3\sqrt{5}+20\sqrt{5}}{2\sqrt{3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{5}}{2\sqrt{3}}\quad (\textit{Denominator has } \sqrt{3} \textit{ which is irrational. Must ratinalise the denominator.})$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{5}}{2\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{5}\times\sqrt{3}}{2\sqrt{3}\times\sqrt{3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{5\times 3}}{2\sqrt{3\times 3}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{15}}{2\sqrt{9}}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{15}}{2\times 3}$$

$$\frac{3\sqrt{20}-\sqrt{45}+4\sqrt{125}}{2\sqrt{3}}=\frac{23\sqrt{15}}{6}$$

ONE

Question 11

A school had 1 200 *learners in* 2008. 60% *of the learners took mathematics.*

$Number\ of\ learners\ who\ took\ Math = 60\%\ of\ 1200$

$$Number\ of\ learners\ who\ took\ Math = \frac{60}{100}\times\frac{1200}{1}$$

$$Number\ of\ learners\ who\ took\ Math = \frac{60}{1}\times\frac{12}{1}$$

$$6\times 12 = 6\times 10 + 6\times 2$$

$$6\times 12 = 60 + 12$$

$$6\times 12 = 72$$

$$Number\ of\ learners\ who\ took\ Math = \frac{60\times 12}{1\times 1}$$

$$Number\ of\ learners\ who\ took\ Math = \frac{720}{1}$$

$$Number\ of\ learners\ who\ took\ Math = 720$$

$There\ were\ four\ mathematics\ teachers.$

$Number\ of\ Math\ teachers: Number\ of\ Math\ learners = 4: 720$

$$Number\ of\ Math\ teachers: Number\ of\ Math\ learners = \frac{4}{4}:\frac{720}{4}$$

$$Number\ of\ Math\ teachers: Number\ of\ Math\ learners = 1: 180$$

In 2009 *the enrolment will increase by* 15%, *but only* 30 *more learners* (*compared to* 2008)*will take mathematics*.

The school will appoint one more mathematics teacher in 2009.

$number\ of\ learners\ in\ 2009 = 1200(1 + 15\%)$

$number\ of\ learners\ in\ 2009 = 1200\left(\frac{1}{1} + \frac{15}{100}\right)$

$number\ of\ learners\ in\ 2009 = 1200\left(\frac{100}{100} + \frac{15}{100}\right)$

$number\ of\ learners\ in\ 2009 = 1200\left(\frac{100 + 15}{100}\right)$

$number\ of\ learners\ in\ 2009 = 1200\left(\frac{115}{100}\right)$

$number\ of\ learners\ in\ 2009 = 12\left(\frac{115}{1}\right)$

$number\ of\ learners\ in\ 2009 = 12 \times 115$

$number\ of\ learners\ in\ 2009 = 1380$

$number\ of\ learners\ who\ took\ Math\ in\ 2009 = 720 + 30$

$number\ of\ learners\ who\ took\ Math\ in\ 2009 = 750$

$number\ of\ Math\ teachers\ in\ 2009 = 4 + 1$

$number\ of\ Math\ teachers\ in\ 2009 = 5$

A. *In* 2008 *the ratio of the number of mathematics teachers to the number of mathematics learners was* 180 *to* 1.???

In 2008 *the ratio of the number of mathematics teachers to the number of mathematics learners was* 1 *to* 180.

A is NOT true.

$B. In\ 2009\ the\ school\ will\ have\ 1\ 380\ learners.???$
$B\ is\ true.$

$C. In\ 2009\ the\ ratio\ of\ the\ number\ of\ mathematics\ learners\ to\ the\ number\ of\ mathematics\ teachers\ will\ be\ 150\ to\ 1.$

$Number\ of\ Math\ learners: Number\ of\ Math\ teachers = 750:5$

$Number\ of\ Math\ learners: Number\ of\ Math\ teachers = \frac{750}{5}:\frac{5}{5}$

$Number\ of\ Math\ learners: Number\ of\ Math\ teachers = 150:1$

$C\ is\ true.$

$FIVE$

<u>*Question* 12</u>

$Suppose\ the\ price\ of\ a\ pair\ of\ shoes, including\ VAT\ (at\ a\ rate\ of\ 14\%), is\ R248. Then\ the\ VAT\ is????$

$To\ use\ A = P(1+i)^n$

$A =\ price\ including\ VAT$

$P = price\ excluding\ VAT$

$i = 14\%$

$n = 1$

$Note\ VAT = A - P$

$A = P(1+i)^n$

$R248 = P(1+14\%)^1$

$R248 = P\left(1+\frac{14}{100}\right)$

$R248 = P\left(\frac{1}{1}+\frac{14}{100}\right)$

$R248 = P\left(\frac{100}{100}+\frac{14}{100}\right)$

$R248 = P\left(\frac{100+14}{100}\right)$

$R248 = P\left(\frac{114}{100}\right)$

$$R248\left(\frac{100}{114}\right) = P$$

$$P = R248\left(\frac{100}{114}\right)$$

$$The\ price\ excluding\ VAT = R248\left(\frac{100}{114}\right)$$

$$VAT = A - P$$

$$VAT = R248 - R248\left(\frac{100}{114}\right)$$

$$VAT = R248\left[1 - \left(\frac{100}{114}\right)\right]$$

$$VAT = R248\left[\frac{1}{1} - \frac{100}{114}\right]$$

$$VAT = R248\left[\frac{114}{114} - \frac{100}{114}\right]$$

$$VAT = R248\left[\frac{114 - 100}{114}\right]$$

$$VAT = R248\left[\frac{14}{114}\right]$$

$THREE$

Question 13

$$\frac{36\ 000\ 000 \times 25}{100\ 000 \times 3\ 000\ 000} = \frac{36 \times 25}{100\ 000 \times 3}$$

$$\frac{36\ 000\ 000 \times 25}{100\ 000 \times 3\ 000\ 000} = \frac{36 \times 25 \div 25}{100\ 000 \div 25 \times 3}$$

$$\frac{36\ 000\ 000 \times 25}{100\ 000 \times 3\ 000\ 000} = \frac{36 \times 1}{4\ 000 \times 3}$$

$$\frac{36\ 000\ 000 \times 25}{100\ 000 \times 3\ 000\ 000} = \frac{36}{12\ 000}$$

$$\frac{36\ 000\ 000 \times 25}{100\ 000 \times 3\ 000\ 000} = \frac{36 \div 3}{12\ 000 \div 3}$$

$$\frac{36\ 000\ 000 \times 25}{100\ 000 \times 3\ 000\ 000} = \frac{12}{4\ 000}$$

$$\frac{36\,000\,000 \times 25}{100\,000 \times 3\,000\,000} = \frac{12 \div 4}{4\,000 \div 4}$$

$$\frac{36\,000\,000 \times 25}{100\,000 \times 3\,000\,000} = \frac{3}{1\,000}$$

$$\frac{36\,000\,000 \times 25}{100\,000 \times 3\,000\,000} = 0{,}003$$

$$\frac{36\,000\,000 \times 25}{100\,000 \times 3\,000\,000} = 3 \times 10^{-3}$$

A is true.

B. $42_{10} = 101010_2$????

Division by 2	*Remainder*
$\frac{42}{2} = 21$	0
$\frac{21}{2} = 10$	1
$\frac{10}{2} = 5$	0
$\frac{5}{2} = 2$	1
$\frac{2}{2} = 1$	0
$\frac{1}{2} = 0$	1

So $42_{10} = 101010_2$

B is true.

C. $3\frac{3}{4} : 1\frac{1}{2} = \frac{3\times4+3}{4} \ : \ \frac{1\times2+1}{2}$

$$3\frac{3}{4} : 1\frac{1}{2} = \frac{12+3}{4} \ : \ \frac{2+1}{2}$$

$$3\frac{3}{4} : 1\frac{1}{2} = \frac{15}{4} \ : \ \frac{3}{2}$$

$$3\frac{3}{4} : 1\frac{1}{2} = \frac{15}{4} \times 4 \ : \ \frac{3}{2} \times 4 \qquad Note \frac{4}{2} = 2$$

$$3\frac{3}{4} : 1\frac{1}{2} = 15 \ : \ 3 \times 2$$

$$3\frac{3}{4} : 1\frac{1}{2} = 15 \ : \ 6$$

$3\frac{3}{4} : 1\frac{1}{2} = \frac{15}{3} : \frac{6}{3}$

$3\frac{3}{4} : 1\frac{1}{2} = 5 : 2$

C is true.

FIVE

Question 14

A. $LHS = \frac{1}{3^{-1}}$ *AND* $RHS = \left(\frac{1}{3}\right)^{-1}$

$LHS = \frac{1 \times 3^{+1}}{1}$ *AND* $RHS = \left(\frac{1 \times 3^{-1}}{1}\right)^{-1}$

$LHS = 1 \times 3$ *AND* $RHS = (3^{-1})^{-1}$

$LHS = 3$ *AND* $RHS = 3^{-1 \times -1}$

$LHS = 3$ *AND* $RHS = 3^{+1}$

$LHS = 3$ *AND* $RHS = 3$

A is true

B. $LHS = \frac{\frac{1}{4}}{2}$ *AND* $RHS = \frac{1}{2}$

$LHS = \frac{1/4}{2}$ *AND* $RHS = \frac{1}{2}$

$LHS = \frac{1}{4} \div 2$ *AND* $RHS = \frac{1}{2}$

$LHS = \frac{1}{4} \div \frac{2}{1}$ *AND* $RHS = \frac{1}{2}$

$LHS = \frac{1}{4} \times \frac{1}{2}$ *AND* $RHS = \frac{1}{2}$

$LHS = \frac{1 \times 1}{4 \times 2}$ *AND* $RHS = \frac{1}{2}$

$LHS = \frac{1}{8}$ *AND* $RHS = \frac{1}{2}$

B is NOT true

$C. \quad LHS = \frac{3^0}{3} \quad AND \quad RHS = 1^0$

$LHS = \frac{1}{3} \quad AND \quad RHS = 1$

$C\ is\ NOT\ true.$

ONE

<u>*Question* 15</u>

$A.\ \ 0{,}10301 = 10{,}301 \times 10^{-2}\ \ in\ scientific\ notation.$

$In\ scientific\ notation\ there\ must\ be\ only\ one\ digit\ before\ the\ decimal\ comma.$

$0{,}10301 = 1{,}030 \times 10^{-1}\ in\ scientific\ notation.$

$A\ is\ NOT\ true.$

$B.\ \ LHS = \sqrt{36 + 64} \quad AND \quad RHS = 6 + 8$

$LHS = \sqrt{100} \quad AND \quad RHS = 14$

$LHS = \ 10 \quad AND \quad RHS = 14$

$B\ is\ NOT\ true$

$C. If\ the\ profit\ of\ a\ business\ was\ Rx, and\ the\ profit\ increases\ by\ 50\%, the\ profit\ will\ then\ be\ R\left(\frac{x}{2}\right).$

$Note\ that\ R\left(\frac{x}{2}\right)\ is\ small\ than\ Rx. So\ the\ profit\ would\ have\ decreased. Obviosly\ not\ true.$

$Now, let\ us\ find\ the\ correct\ new\ profit.$

$To\ use\ A = P(1 + i)^n$

$A = \ new\ profit$

$P = old\ profit$

$i = 50\%$

$n = 1$

$A = P(1 + i)^n$

$A = Rx(1 + 50\%)^1$

$A = Rx\left(\frac{1}{1} + \frac{50}{100}\right)$

$A = Rx\left(\frac{100}{100} + \frac{50}{100}\right)$

$A = Rx\left(\frac{100 + 50}{100}\right)$

$A = Rx\left(\frac{150}{100}\right)$

$A = Rx\left(\frac{15}{10}\right)$

$A = Rx\left(\frac{15 \div 5}{10 \div 5}\right)$

$A = Rx\left(\frac{3}{2}\right)$

$A = R\left(\frac{3x}{2}\right)$

$C\ is\ NOT\ true.$

$FIVE.$

<u>*Question* 16</u>

$A.\ \left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$ $Check\ the\ laws\ of\ exponents.$

$Proof.$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{a^{+1}}{b^{+1}}\right)^{-n}$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b^{-1}}{a^{-1}}\right)^{-n}$

$\left(\frac{a}{b}\right)^{-n} = \left(\left(\frac{b}{a}\right)^{-1}\right)^{-n}$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{-1\times-n}$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{+n}$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$

$A\ is\ true.$

$B.\quad (a \times b)^m = a^m \times b^m\ \ Check\ the\ laws\ of\ exponents.$

$B\ is\ true$

$C.\quad \frac{(a^n)^m}{(a^n)^{m+2}} = \frac{a^{n\times m}}{a^{n(m+2)}}$

$\frac{(a^n)^m}{(a^n)^{m+2}} = \frac{a^{nm}}{a^{nm+2n}}$

$\frac{(a^n)^m}{(a^n)^{m+2}} = a^{nm-nm-2n}$

$\frac{(a^n)^m}{(a^n)^{m+2}} = a^{-2n}$

$\frac{(a^n)^m}{(a^n)^{m+2}} = \frac{1}{a^{2n}}$

$C\ is\ NOT\ true.$

$FOUR$

<u>*Question* 17</u>

$10kg/_{m^2} = ????$

$1\ kg = 1000\ g$

$\therefore 10\ kg = 10\ 000\ g$

$1\ m = 10^3\ mm$

$1\ m^2 = 1\ m \times 1\ m$

$1\ m^2 = 10^3\ mm\ \times 10^3\ mm$

$1\ m^2 = 10^3 \times 10^3\ mm\ \times\ mm$

$1\ m^2 = 10^{3+3}\ mm^2$

$1\ m^2 = 10^6\ mm^2$

$10kg/_{m^2} = \frac{10\ kg}{m^2}$

$10kg/_{m^2} = \frac{10\ 000\ g}{10^6\ mm^2}$

$10kg/_{m^2} = \frac{10^4\ g}{10^6\ mm^2}$

$10kg/_{m^2} = \frac{10^4 \times 10^{-6}\ g}{mm^2}$

$10kg/_{m^2} = \frac{10^{4-6}\ g}{mm^2}$

$10kg/_{m^2} = \frac{10^{-2}\ g}{mm^2}$

$10kg/_{m^2} = 10^{-2}\ g/mm^2$

TWO

Question 18

Thabo paints a room twice as fast as Gerry does. Gerry takes 10 *minutes longer than Pete to paint the same room. If Thabo takes* 3 *hours to paint the room, then the time it takes Pete to paint the room is* ????

Let x minutes be the time it takes Pete to paint the room when working alone.

Then it takes $(x + 10)$ *minutes for Gerry to paint the room when working alone.*

Then it takes $\frac{x + 10}{2}$ *minutes for Thabo to paint the room when working alone.*

$\frac{x + 10}{2}$ *minutes is equivalent to* 3 *hours.*

But 3 *hours* $= 3 \times 60$ *minutes*

3 *hours* $= 180$ *minutes*

$\frac{x + 10}{2} = 180$

$$\frac{x+10}{2} \times 2 = 180 \times 2$$

$$x + 10 = 360$$

$$x \quad = 360 - 10$$

$$x \quad = 350$$

Pete takes 350 *minutes to paint the room when working alone.*

$$350\ minutes = \frac{350}{60}\ hours$$

$$350\ minutes = \frac{35}{6}\ hours$$

$$350\ minutes = 5\frac{5}{6}\ hours$$

$$350\ minutes = 5\ hours\ + \frac{5}{6}\ hours$$

$$350\ minutes = 5\ hours\ and\ \frac{5}{6} \times 60\ minutes$$

$$350\ minutes = 5\ hours\ and\ \frac{5}{6} \times \frac{60}{1}\ minutes$$

$$350\ minutes = 5\ hours\ and\ \frac{5}{6 \div 6} \times \frac{60 \div 6}{1}\ minutes$$

$$350\ minutes = 5\ hours\ and\ \frac{5}{1} \times \frac{10}{1}\ minutes$$

$$350\ minutes = 5\ hours\ and\ \frac{5 \times 10}{1 \times 1}\ minutes$$

$$350\ minutes = 5\ hours\ and\ 50\ minutes$$

THREE

Question 19

*A. If Susan earns R*3 000 *per month and her salary is* 25% *more than Isaac's salary, then Isaac earns R*3 000 − (25% *of R*3 000).

Note that the 25% *above is of Susan's salary it is not* 25% *of Isaac's salary. The reasoning is flawed.*

Type equation here.

$To\ use\ A = P(1+i)^n$

$A =\ Susan's\ salary$

$P = Isaac's\ salary$

$i = 25\%$

$n = 1$

$A = P(1+i)^n$

$R3\ 000 = P(1+25\%)^1$

$R3\ 000 = P\left(\frac{1}{1} + \frac{25}{100}\right)$

$R3\ 000 = P\left(\frac{100}{100} + \frac{25}{100}\right)$

$R3\ 000 = P\left(\frac{100+25}{100}\right)$

$R3\ 000 = P\left(\frac{125}{100}\right)$

$R3\ 000\left(\frac{100}{125}\right) = P$

$P = R3\ 000\left(\frac{100}{125}\right)$

$P = \frac{R3\ 000}{1} \times \frac{100}{125}$

$P = \frac{R3\ 000}{1} \times \frac{100 \div 25}{125 \div 25}$

$P = \frac{R3\ 000}{1} \times \frac{4}{5}$

$P = \frac{R3\ 000 \div 5}{1} \times \frac{4}{5 \div 5}$

$P = \frac{R600}{1} \times \frac{4}{1}$

$P = R600 \times 4$

$P = R2\ 400$

$Isaac\ earns\ R2\ 400.\quad Verify\ this\ by\ finding\ 25\%\ of\ R2\ 400\ then\ add\ the\ result\ to\ R2\ 400.$

Anyway, the given $R3\,000 - (25\%\ of\ R3\,000)$ *is equal to* $R3\,000 - \left(\frac{25}{100} \times R3\,000\right)$

$R3\,000 - \left(\frac{25}{100} \times R3\,000\right) = R3\,000 - (25 \times R30)$

$R3\,000 - \left(\frac{25}{100} \times R3\,000\right) = R3\,000 - (R750)$

$R3\,000 - \left(\frac{25}{100} \times R3\,000\right) = R2\,250$ *This is not what Isaac's correct salary.*

A is NOT true.

B. A car and bus both leave Unisa at the same time. The car arrives at Ellis Park 15 *minutes before the bus.*

Suppose the bus takes x minutes to travel from Unisa to Ellis Park.

Then the car takes $(x - 15)$*minutes to reach Ellis Park.*

The car arrived earlier meaning that the car was faster than the bus.

The car took less time to get to Ellis Park compared to the bus.

B is true.

C. In 2009 *I earn* 50% *more per month then I earned per month in* 2008.

In 2009 *my monthly expenses decrease by* 50%. *Thus in* 2009 *I have double the amount of money left each month compared to* 2008.

Earnings

To use $A = P(1 + i)^n$

$A =$ *Salary in* 2009

$P =$ *Salary in* 2008

$i = 50\%$

$n = 1$

$A = P(1 + i)^n$

$A = P(1 + 50\%)^1$

$A = P\left(\frac{100}{100} + \frac{50}{100}\right)$

$A = P\left(\frac{150}{100}\right)$

$A = P\left(\frac{15}{10}\right)$

$A = P\left(\frac{15 \div 5}{10 \div 5}\right)$

$A = P\left(\frac{3}{2}\right)$

Expenses

To use $Y = X(1 - i)^n$

$Y =$ *Expenses in* 2009

$X =$ *Expenses in* 2008

$i = 50\%$

$n = 1$

$Y = X(1 - i)^n$

$Y = X(1 - 50\%)^1$

$Y = X\left(\frac{100}{100} - \frac{50}{100}\right)$

$Y = X\left(\frac{100 - 50}{100}\right)$

$Y = X\left(\frac{50}{100}\right)$

$Y = X\left(\frac{5}{10}\right)$

$Y = X\left(\frac{5 \div 5}{10 \div 5}\right)$

$Y = X\left(\frac{1}{2}\right)$

In 2008

$Money\ left = P - X$

In 2009

$Money\ left = A - Y$

$Money\ left = P\left(\frac{3}{2}\right) - X\left(\frac{1}{2}\right)$

$Money\ left = \frac{3P}{2} - \frac{X}{2}$

$Money\ left = \frac{3P - X}{2}$

$Money\ left = \frac{1}{2} \times (3P - X)$ *This is not the same as* $2 \times (P - X)$

C is NOT true.

TWO

Question 20

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = \frac{3^3 \times (3^3)^2 \times (3 \times 5)}{5^{-1} \times 3^2}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = \frac{3^3 \times 3^{3\times2} \times 3 \times 5}{5^{-1} \times 3^2}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = \frac{3^3 \times 3^6 \times 3 \times 5}{5^{-1} \times 3^2}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = \frac{3^{3+6+1} \times 5}{5^{-1} \times 3^2}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = \frac{3^{10} \times 5}{5^{-1} \times 3^2}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = 3^{10} \times 3^{-2} \times 5 \times 5^{+1}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = 3^{10-2} \times 5^{1+1}$$

$$\frac{3^3 \times 27^2 \times 15}{5^{-1} \times 3^2} = 3^8 \times 5^2$$

ONE