SETS (JUNIOR)

1. If P = {-2, -1, 0, 1, 2,3, 4 …….}, express

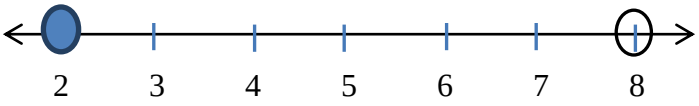
   a) P in set builder notation

   $P = \{x : x \geq -2; x \in Z\}$ (The inequality $\geq$ is used since elements are building from 2 (inclusive) to the positive side).

   b) Write Set A in listed form,

   $A = (x : 2 \leq x < 8$

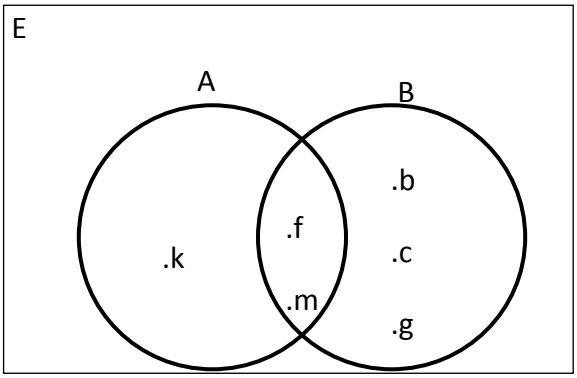
   $x < 8, x \geq 2$ (By splitting the set builder notation)



(Using the number line)

$\therefore A = \{2, 3, 4, 5, 6, 7\}$ (2 is included in the solution set when 8 is **not** included)

2. Using the information given in the Venn diagram below



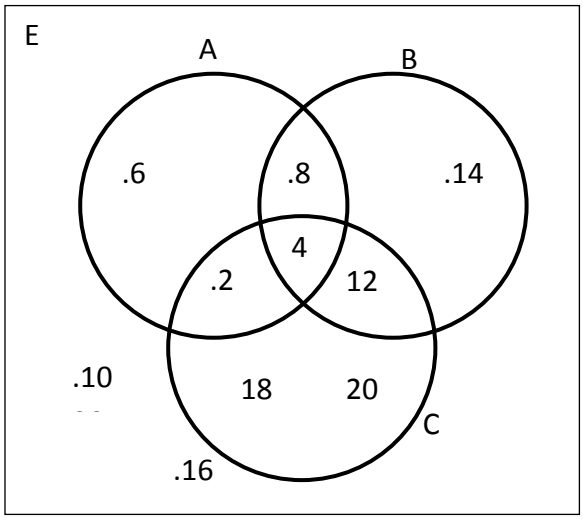
   a) List the Set (A ∩ B)
   (A∩B) = {f, m}

   b) List (A ∩B)′

$(A \cap B)' = \{k, b, c, g\}$ (Complement of a set are elements outside the given sets $(A \cap B)$

3. E (Universal Set) = {2, 4, 6, 8, 10, 12, 14, 18, 20}
   A = {2, 4, 6. 8}
   B = {4, 8, 12, 14} C = {2, 4, 12, 18, 20}

   i. Illustrate the above information on a Venn diagram.



   ii. List the Set
   $(A \cap B \cap C) = \{4\}$ (The intersection of three sets)

   iii. $(A \cap B') \cup C$
   $A \cap B' = \{2, 4, 6, 8\} \cap \{2, 6, 10, 16, 18, 20)$ (Dealing with what is inside the brackets by listing Set A and Set B′)

   $(A \cap B') = \{2, 6\}$

   Set C = {2, 4, 12, 18, 20}

   $\therefore (A \cap B') \cup C = \{2,6\} \cup \{2,4,12,18,20\}$
   $(A \cap B') \cup C = \{2,4,6,12,18,20\}$ (Do not repeat elements in the union of sets)

   iv. Find the value of $\cap$ ($A \cup B \cup C)'$

   $(A \cup B \cup C)' = \{10,16\}$ By listing
   $\therefore \cap (A \cup B \cup C)' = 2$ (There are two elements in that Set)

v. In the Venn diagram, shade the region

$(A' \cup B) \cap C$

$(A' \cup B) = \{12, 14, 18, 20, 10, 16) \cup \{4, 8, 12, 14\}$

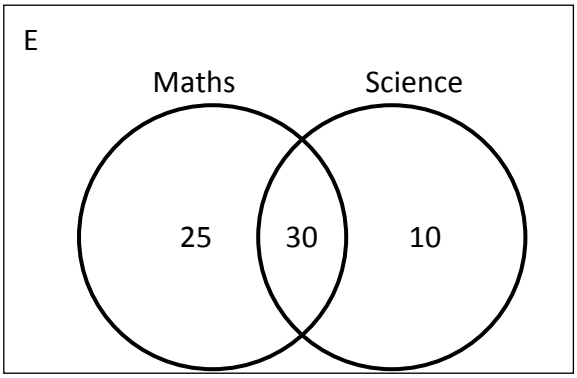
$(A' \cup B) = \{4, 8, 10, 12, 14, 16, 18, 20\}$

$(A' \cup B) \cap C = \{4, 8, 10, 12, 14, 16, 18, 20\} \cap \{2, 4, 12, 18, 20\}$

$(A' \cup B) \cap C$ = {4, 12, 18, 20} Shade the region where these elements are lying.

4. 70 learners at Mansa Secondary School were asked to mention their favourite subjects between Maths and Science.

The results are shown in a Venn diagram below



i. How many learners like Maths only? **25 learners**

ii. How many learners do not like Maths nor Science?

70 – (25 + 30 + 10)

70 – (65)

70 – 65

= 5 learners do not like Maths nor Science

INDEX NOTATION, SQUARE ROOTS AND CUBE ROOTS

INDICES – are just a shorthand way of expressing products.

Consider 2^6. The 2 is called the base, the 6 is called the power or index. This is read as " 2 to the power of 6" and is calculated as

2 x2 x 2 x 2 x 2 x2 = 64.

Note that 2^6 is NOT EQUAL to 2 x 6 = 12.

Example1

Expand

(a) a^3 (b) 3^5 (c) 2.5^2

Solutions

(a) a^3 = a x a x a

(b) 3^5 = 3 x 3 x 3 x 3 x 3

(c) 2.5^2 = 2.5 x 2.5

Example 2

Write the following in short

(a) 3 x 3

(b) 11 x 11 x 11 x 11 x 11

Solutions

(a) 3 x 3 = 3^2

(b) 11 x 11 x 11 x 11 x 11 = 11^5

ROOTS

(i) SQUARE ROOTS

Are just the opposite to squares

That is, 3^2 = 3 x 3 = 9. So the **square root of 9** written as $\sqrt{9}$ is equal to 3

That is, $\sqrt{9} = 3$.

(ii) <u>CUBE ROOTS</u>

Are just the opposite to cubes

That is, $2^3 = 2 \times 2 \times 2 = 8$. Therefore the cue root of 8, written as $\sqrt[3]{8}$ is 2.

That is, $\sqrt[3]{8} = 2$.

EXERCISE

1. Find the value of

   (a) 2^3 (b) 12^2 (c) 6^3 (d) 10^4

2. Evaluate the following

   (a) $\sqrt{81}$ (b) $\sqrt[3]{64}$ (c) $\sqrt[3]{125}$ (d) $\sqrt{121}$

3. Evaluate $5 + (0.5)^2$

4. Given that $L = \sqrt{\frac{128}{n-1}}$, find the positive value of L when n = 3.

5. Evaluate $-2^2 + 3^2$

6. Find the value of $(0.04)^3$.

7. If a = -2, b = 3 and c = -6, evaluate $\sqrt{abc}$.

LAWS OF INCES

MULTIPLICATION AND DIVISION OF POWERS OF THE SAME BASE

W e can express the product of two powers in index form if the two powers have the same base.

EXAMPLE

Express the product of 5^2 and 5^4 in the index form.

$5^2 \times 5^4 = (5 \times 5) \times (5 \times 5 \times 5 \times 5)$

$= 5 \times 5 \times 5 \times 5 \times 5 \times 5$

$= 5^6$.

Example 2.

Simplify $3^2 \times 3^6$

$3^2 \times 3^6 = (3 \times 3) \times (3 \times 3 \times 3 \times 3 \times 3 \times 3)$

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$= 3^8$.

When we multiply powers of the same base, we add the indices.

$$\mathbf{a^m \times a^n = a^{m+n}}$$

Similarly when dividing powers, we can express the answer in index form if the two powers have the same base.

Examples

Simplify (a) $7^5 \div 7^2$ (b) $\frac{9^6}{9^4}$

Solutions

(a) $7^5 \div 7^2 = \frac{7 \times 7 \times 7 \times 7 \times 7}{7 \times 7}$

$= 7 \times 7 \times 7$

$= 7^3$

(b) $\frac{9^6}{9^4} = \frac{9 \times 9 \times 9 \times 9 \times 9 \times 9}{9 \times 9 \times 9 \times 9}$

When we divide powers of the same base, we subtract the indices.

$$\mathbf{a^n \div a^m = a^{n-m}}$$

Exercise

1. Simplify the following

   (a) $p^4 \times p^2$ (b) $a^{10} \div a^5$

2. Calculate $(3x)^2 \div 3x^4$

APPROXIMATION AND ESTIMATION

1. Numbers can be rounded off to the:

(a) Nearest unit

(b) Appropriate number of decimal places

(c) Number of decimal places

2. Standard form or scientific notation is a way of expressing a number in the form a x 10^n, where $1 \leq a < 10$ and n is an integer. This method is useful in science and engineering, where the numbers are either very small or very large.

   Example

   The speed of light is 300, 000, 000metres per second. This number can be written as 3 x 10^8 m/s.

   Standard form for numbers greater than 1

   Example

   Express 509, 970 in standard form.

   Solution

   509,970 = 5.09970 x 10^5. The value of n is 5 which was found by counting the number of places the decimal point moved from right to left before it was placed between 5 and 0.

   Standard form for numbers less than 1

Numbers less than 1 can as be expressed in standard form. For example, **0.0245** can be written as **2. 45 x 10^{-2}** , where the decimal point was moved from left to right and placed between 2 and 4. As the point moves from left to right the value of n will assume a negative sign.

Example

Express 0.0000276 in standard forn.

Solution

0.0000276 = 2.76 x 10^{-5}. You can obsrve that n = -5.

EXERCISE

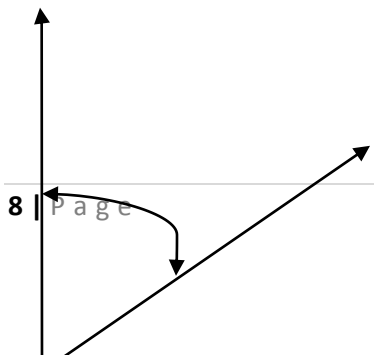
1. Write to the nearest hundred 3463 [Ans. 3500]
2. Express 0.00815 in standard form. [8.15 x 10^{-3}]
3. If 0.000085 = 8.5×10^{n}, find the value of n. [n = 5]
4. Write 489.35 written to 4 significant figures. [489.4]
5. Write 653.1 in standard form. [6.531 x 10^{2}]
6. Express 0.537 as a percentage correct to two significant figures. [54%]
7. Simplify 4.8×10^{-3} . [0.0048]
8. Round off

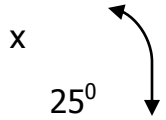
   (i) 0.2758 c0rrect to 2 decimal places [0.28]

   (ii) 1.10546 to 2 significant figures. [1.1]

1.

a Find the value of x



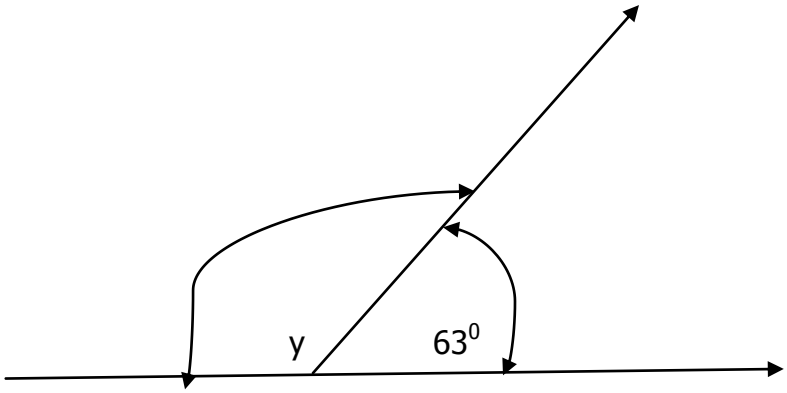


X+25 =90

X+25-25=90-25

$X=65^0$

b. Find the angle Y



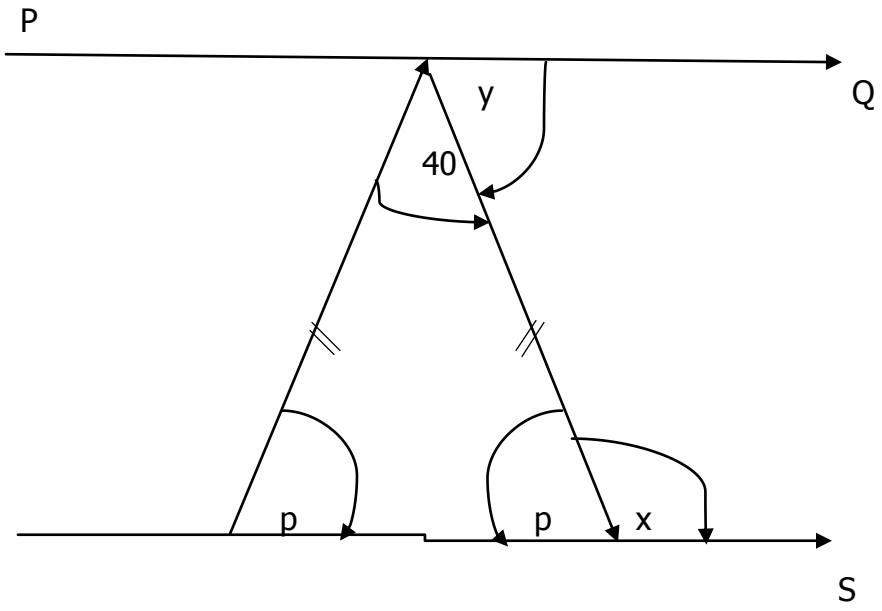
<ABC is a straight line $=180^0$

Y+63=180 ……supplementary angles add up to 180^0

Y+63-63=180-63

$Y=117^0$

2.



In the diagram above PQ,and RS are parallel lines .Angle BAC=40^0 .Triangle ABC is such that AB =AC.Calculate the size of x and y.

40+p+p=180 ……Sum of angles of a triangle

40+2p=180

2p=180-4070+x=180

2p =140

$\frac{2p}{2} = \frac{140}{2}$

P=70^0

p+x=180 ……Sum of complementary angles

substituting the value of P in the equation.

x=180-70

X= 110^0

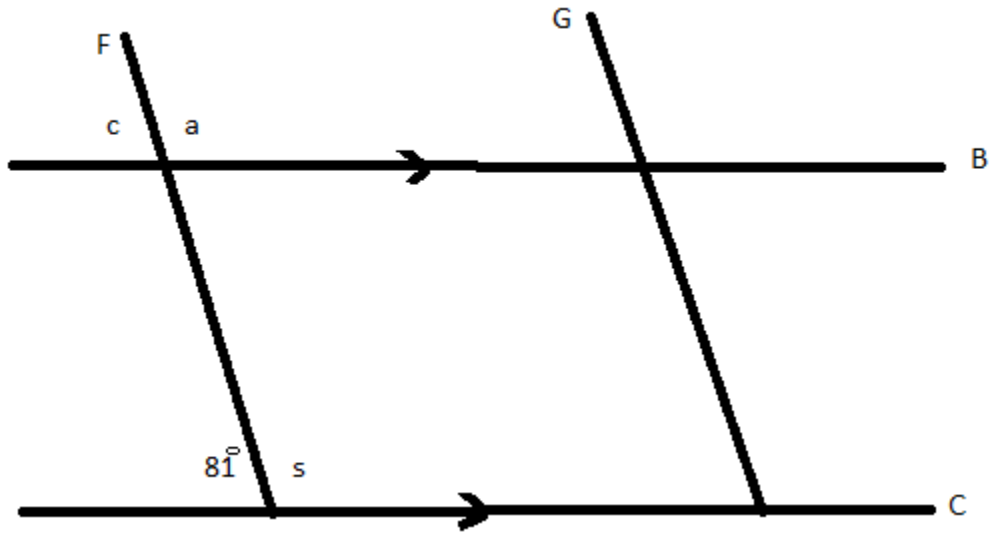
x+y =180 ……Co-interior angles add up to

110+y=180 $180^{0.}$

Y=180-110

$Y=70^0$

3.Find the value of a ,r, q, c and s and give the reason for each of your answers.



S +81 =180 .....They are supplementary angles

S =180-81

$S=99^0$

S+81=180 .....They are supplementary angles.

S=180-81

$S=99^0$

a =s

$a =99^0$ .....They are corresponding angles

$r =81^0$ .....They are alternate angles

q =s

q =99^0 .....They are also alternate angles

a +c + q +r =360 ……Sum of angles around a point

99+C+99+81 =360 …. ……Sum of angles around a point

C =360-279

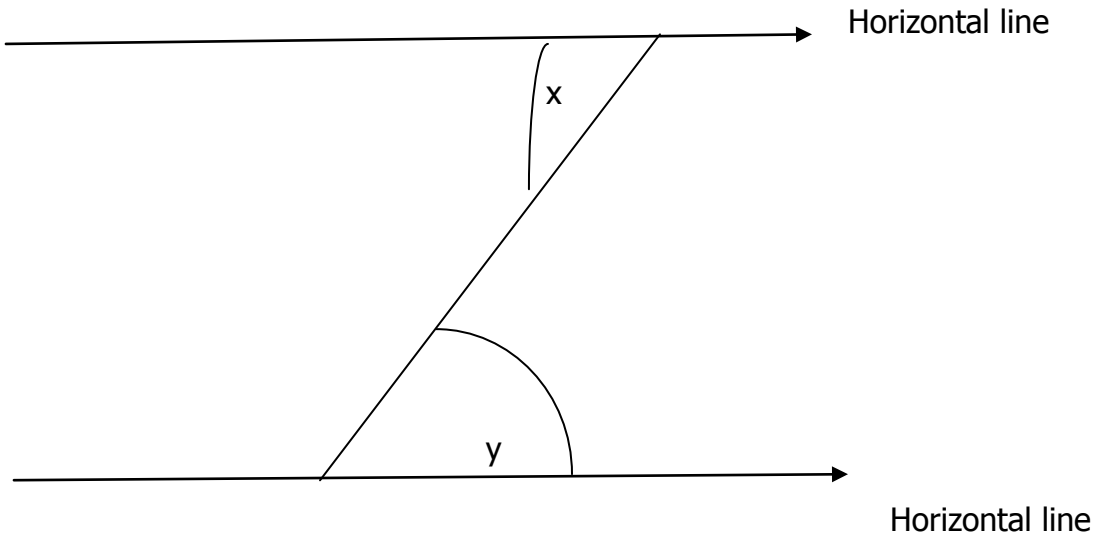
C =81^0 or c=r since they are vertically opposite angles

C=81^0, since r=81^0

4. In the diagram bellow:

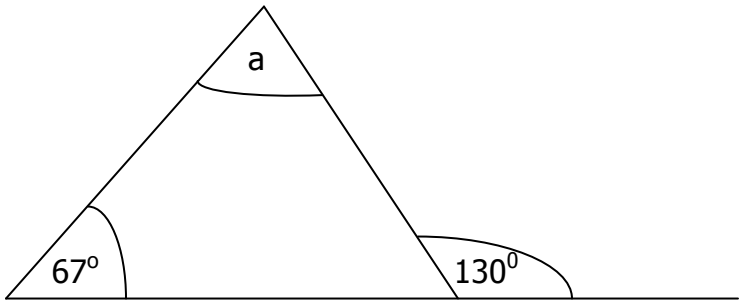
a.Which angle is the angle of elevation?

b. which angle is the angle of depression ?



i. y is an angle of elevation
ii. x is an angle of depression
iii. if < x=55^0 , find the value of y
y=55^0

5. Find angle a in the diagram



a +67 =130…..External angle

a =130-67 is equal to

a=63^0 the opposite

Interior angle

Definition of Bicimal Numbers

- The word bicimal comes from a combination of the words binary and decimal.
- This entails that we are dealing with numbers in base two (2) called binary numbers and decimal numbers.
- A bicimal is the base two analog of a decimal, it has a bicimal point and bicimal places.

Examples of bicimals

- Note : The places in a bicimal can either be terminating or repeating.

1001.011

0.1101

10101

1111.001

- Reminder on converting from base 10 (denary) to base 2 (binary)

2 | 17 when converting 17ten to base two

2 | 8 r 1

2	4 r 0	
2	2 r 0	
2	1 r 0	17ten in base two is 10001two
2	0 r 1	

Converting from binary and denary

Reminder on Converting from binary (base two) and denary (base ten)

Convert 10101two (binary) to base ten (Denary)

	2^4	2^3	2^2	2^1	2^0
1	0	1	0	1	

$1 \times 2^0 = 1$

$0 \times 2^1 = 0$

$1 \times 2^2 = 4$

$0 \times 2^3 = 0$

$1 \times 2^4 = 16$

21ten

Converting decimal numbers in base 10 to bicimal

Example

30.375ten to base two (2)

2	30	
2	15 r 0	
2	7 r 1	
2	3 r 1	
2	1 r 1	
2	0 r 1	11110

then 0.375 x 2= 0.75

0.75 x 2 = 1.5

0.5 x 2 =1.0

therefore: 0. 011two

Then 30.375ten is 11110.011two

Converting numbers in Bicimal to base 10

Example

Convert 0.1101two to base 10

$2^{-1}\ 2^{-2}\ 2^{-3}\ 2^{-4}$

$2\quad 2\quad 2\quad 2$

- $\frac{1}{2}\ \frac{1}{4}\ \frac{1}{8}\ \frac{1}{16}$

1 1 0 1

- $\left(\frac{1}{2}\times 1\right)+\left(\frac{1}{4}\times 1\right)+\left(\frac{1}{8}\times 0\right)+(\frac{1}{16}\times 1)$

$$\frac{1}{2}+\frac{1}{4}+0+\frac{1}{16}$$

$$\frac{8+4+0+1}{16}$$

$\frac{13}{16}$ or 0.8125ten

ACTIVITY

CONVERT THE FOLLOWING TO BICIMAL NUMBERS

A. 19.125
B. 22.375
C. 8.125

CONVERT THE FOLLOWING BICIMALS TO BASE TEN

A. 111.01
B. 0.11101
C. 10101.110

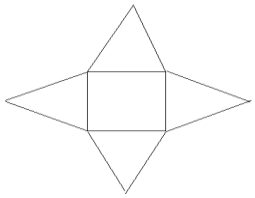
Probability

1.0 Chipeshi has six K 100 notes, four K50 notes, eight K20 notes, four K10 notes and two K5 notes in his wallet. He takes one note at random from his wallet to pay a bill. Which note is more likely to be picked than any other?

(a) K100 (b) K 50 (C) K 20 (D) K 10

Solid shapes

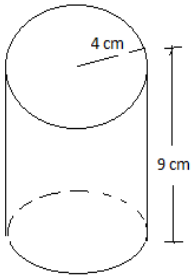
1.0 The figure below is a net of a.....



(a) Triangular –based pyramid
(b) Square – based pyramid
(c) Cone
(d) Cylinder

Section B

2.0 The diagram shows a cylinder with a radius of 4 cm and a height of 9 cm.



Calculate the volume of the cylinder.

Probability

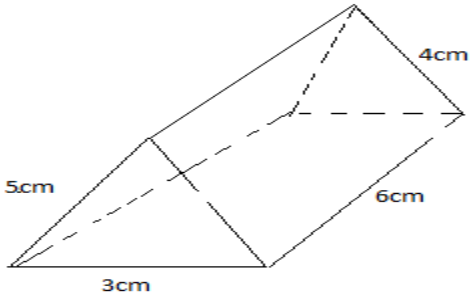
1.0 A sack contains 12 oranges and 8 lemons. If a fruit is picked at random from the sack, find the probability that it is an orange.
[2]

Solid shapes

1. O The volume of a cylinder is 141.3 cm3. Find the radius of the base if the height is 5 cm.

Take π as 3.14

2.0 The diagram below shows a metallic triangular prism.



Find the total surface area.

Solutions

Probability

1.0 C

Solid shapes

1.0 B

SECTION B

VOLUME = Base area X height = πr^2h

= 3.14 x 4x4 x 9
= 452.57 cm3

probability

1.0 P(O) = 12/20
= 3/5

Solid shapes

VOLUME = BASE AREA X HEIGH

141.3 = 3.14 X r^2 X 5

r = 3 cm

1.0 Total surface area = Area of triangles (s) + Area of triangles + Area of rectangle

= 86.291cm^2.

MENSURATION

1. Calculate the principal if the interest is k125,000 the rate is 10% and time is 5years.

SOLUTION

$P = \frac{SI \times 100}{R \times T}$

$= \frac{125000 \times 100}{10 \times 5}$

$= \frac{12500000}{50}$

P = **K250, 000**

2. The bank lends Mrs Musonda K20000 at a rate of interest of $20\frac{1}{2}$%. How much interest does she owe after 2 years?

SOLUTION

$SI = \frac{P \times R \times T}{100}$

$= \frac{20000 \times 20\frac{1}{2} \times 2}{100}$

$=200 \times 41$

SI =**K8200.**

3. Calculate the sample interest on K400 000 at $2\frac{1}{2}$% per annum for 6 month.

SOLUTION.

$$SI=\frac{P\times R\times T}{100}$$

$$=\frac{400\ 000}{100}\times 2\,{}^{1}\!/_{2}\times\frac{6}{12}$$

$$=4000\times\frac{15}{12}$$

$$=\frac{20000}{4}$$

SI = **K500**

4. MrNdabombesha, owns a house valued at k 72 000.00. He offers it for rent at 20% per annum of the value of the house. What monthly rent must he charge ?

SOLUTION:

Rent/annum = $72000\times\frac{20}{100}=k14\ 400.00.$

$$\therefore\ monthly\ rent=\frac{k14\ 400.00}{12}$$

$$\therefore\ monthly\ rent=\boldsymbol{k1\ 200.00}$$

5. If the exchange rate between the Zambian kwacha(K) and the American Dollar is k9.00 per $1

How much Dollar can be exchanged for K 468 000.00?

SOLUTION:

K9.00 to$ 1.00

K468 000.00 to$x$

$$\therefore x=\frac{468000}{9}$$

$$\therefore x=\$52\ 000.00$$

$$\therefore=\mathbf{\$52\ 000.00}\text{ can be exchanged for }\boldsymbol{K468\ 000.00}$$

6. A sofa can be bought forK5 250.00 cash. It can also be bought on higher purchase by paying a

Deposit of K4000.00 plus 5 equal monthly installments of K880.00. How much more would be paid if the sofa is bought on hire purchase?

SOLUTION:

EXTRA Amount paid= $[K4000.00 + 5(K880.00)] - K5\ 250.00$

$= K8\ 400.00 - K5\ 250.00$

$\therefore$ EXTRA Amount paid= $\boldsymbol{K3\ 150.00}$

7. A company sales agent is paid a salary of K5 300.00 per month. He also receives a commission of 3% of the value of the goods sold. Calculate his total income if he sold goods worth K29 000.00.

SOLUTION:

Total income = K5 300.00$+K29\ 000.00 \times \frac{3}{100}$

Total income = K5 300.00$+K870.0$

$\therefore$ Total income = $\mathbf{K6\ 170.00}$

8. A Security guards wage for a 5 day working week is K720.00. Given that she works 8 hours per day, calculate

(i) her wage per year if there are 52 weeks in a year,

(ii) her rate per hour.

SOLUTION:

(i) K720.00$\times\ 52weeks = \boldsymbol{K37,440.00}$

(ii) $K720.00 \div 40hrs/week =$**K18.00**

9. A Car costing K100 000.00 is depreciated at the rate of 5%of the original cost(straight line method) per year. find its book value after 6 years.

SOLUTION:

Book value= $K100\ 000.00 - \left[K100\ 000.00 \times \frac{5}{100} \times 6\right]$

$\therefore$Book value= $K100\ 000.00 - K30\ 000.00$

$\therefore$Book value= $\boldsymbol{K70\ 000.00}$

10. An agent sold a Goat at K330.00. This amount includes 10% commission for the agent. What was the price of the Goat before the commission was added?

SOLUTION:
Let x be the actual cost of the goat = 100%, then,

x = 100%,
K330= 110%,

then x = $\frac{K330 \times 100}{110}$

x = K300.00.

∴ the price of the Goat before the commission was added = **K300.00.**

11. A sales man recieves k 1000 000 as his fixed salary. He however recieves 5% commission on any good sold per month .calculate his monthly income if he sold good worth k5500 000

SOLUTION.

Monthly income

Fixed salary + commission

= 1000 000 + $^{5}/_{100 \times k5500\ 000.}$

= 4000 000+ 27500 00

= k 1275000.

EQUATIONS AND INEQUATIONS

1. (i) Solve the equation $4(x-1)-3(x-2)=6$

SOLUTION.

$= 4x - 4 - 3x + 6 = 6$

$=4x - 3x - 4 + 6 = 6$

$=x + 2 = 6$

$x = 6 - 2$

$\boldsymbol{x = 4}$

(ii) Find the value of y in the equation 3y – 20 = 7.

SOLUTION:

3y – 20 = 7.

$3y-20 + 20 = 7 + 20$

$3y= 27$

$\frac{1}{3} \times 3y = \frac{1}{3} \times 27$

$\therefore y = \mathbf{9}$

(iii) Solve the equation $x - 8 = 3(4 - x)$.

SOLUTION:

$x - 8 = 3(4 - x)$.

$x - 8 = 12 - 3x$

$x + 3x = 12 + 8$

$$4x = 20$$
$$4x \times \frac{1}{4} = 20 \times \frac{1}{4}$$
$$x = \mathbf{5}$$

2. Solve the inequation where $x\{0,1,2,3,4,5,6,7,8,9,10\}$

a. $3x + 1 > 5$ b. $2(2 - 1) > x + 3$ c. $2(x - 1) > 3x - 5$

SOLUTION.

a. $3x + 1 > 5$

$=3x > 5 + 1$

$=3x > 6$

$=\boldsymbol{x} > 2$

The solution set is $\{2,3,4,5,6,7,8,9,10\}$.

b. $2(x - 1) > x + 3$

$=2x - 2 > x + 3$

$=2x - x > 2 + 3$

$x > 5$

The solution set is $\{6,7,8,9,10\}$.

c. $2(x - 1) > 3x - 5$

$\therefore 2x - 2 > 3x - 5$

$\therefore 2x - 3x > 2 - 5$

$\therefore -x > -3$

$\therefore -x \times -1 < -3 \times -1$

$\therefore \quad x < 3$

SIMILARITY AND CONGRUENCE

1. SIMILARITY

Two objects are said to be similar if:

i. The corresponding angles are equal

ii. The ratio of the corresponding sides is the same or equal.

1.1SIMILARITY IN TRIANGLES

For two triangles to be similar, they need to satisfy any of the three cases:

i. Three pairs of corresponding angles are equal (AAA)

ii. The ratio of corresponding sides is the same (SSS)

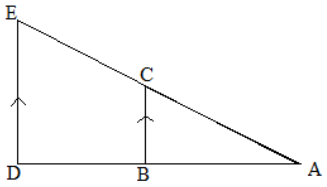
iii. Two pairs of corresponding sides are proportional and the included angles are equal (SAS).

2. CONGRUENCY

Two objects are congruent if they have the same shape and size.

QUESTIONS

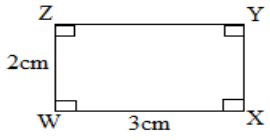
1) State the two triangles in the diagram below which are similar. Give the reason why.

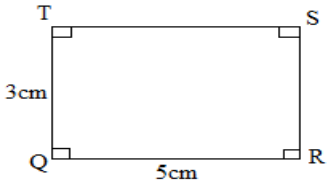


Answer: ΔABC and ΔADE are similar.

Since DE and BC are parallel, $<ABC = <ADE$ and $<ACB = <AED$ (Corresponding Angles). <A is common to both triangles, hence satisfying AAA.

2) Determine whether or not the two rectangles below are similar



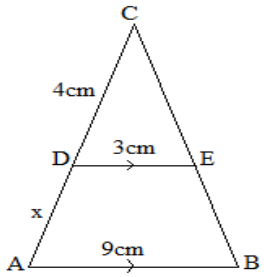


Solution

$2:3 \neq 3:5$

Therefore XYWZ and RSTQ are not similar.

a) In the diagram, DE is parallel to AB, DE = 3cm, AB = 9cm and CD = 4cm



b) Find the ratio of corresponding sides.

c) Find the value of x

Solution

a) 3: 9 = 1: 3

b) $\frac{3}{9} = \frac{4}{4+x}$

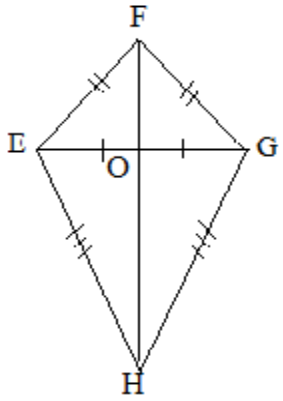
$3(4+x) = 9\times4$

$12 + 3x = 36$

$3x = 24$

$X = 8cm$

3) Name all the pairs of congruent triangles in the figure below:



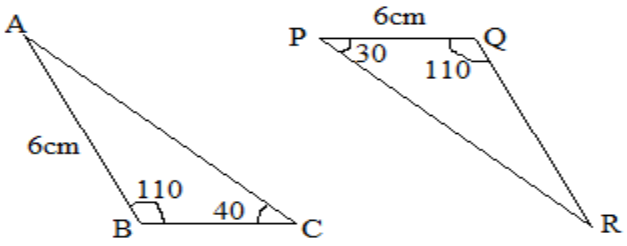
Solution

ΔEOF = ΔGOF

ΔEOH = ΔGOH

ΔFEH = ΔFGH

4) Show that ΔABC and ΔPQR below are congruent



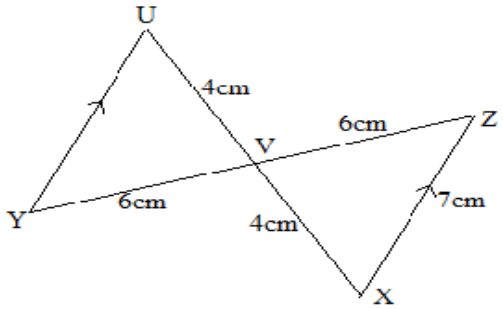
Answer:

<ABC = <PQR,

<BAC = <RPQ = 30˚ and

<BCA = <PRQ = 40˚

5) Find the length of YU in the diagram below



Solution:

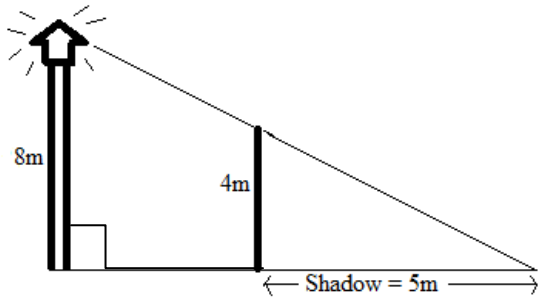
<UVY = <XVZ (Vertically opposite angles)

UV = XV

YV = VZ

Therefore UY = XZ = 7cm.

6) A wall, which is 4m high, is built next to a street light that is 8m high. The shadow of the wall is 5m long. How far is the wall from the street light?



Solution

$$\frac{4}{8} = \frac{5}{5+x}$$

$4(5+x) = 8\times5$

$20+ 4x = 40$

$X = 5m$

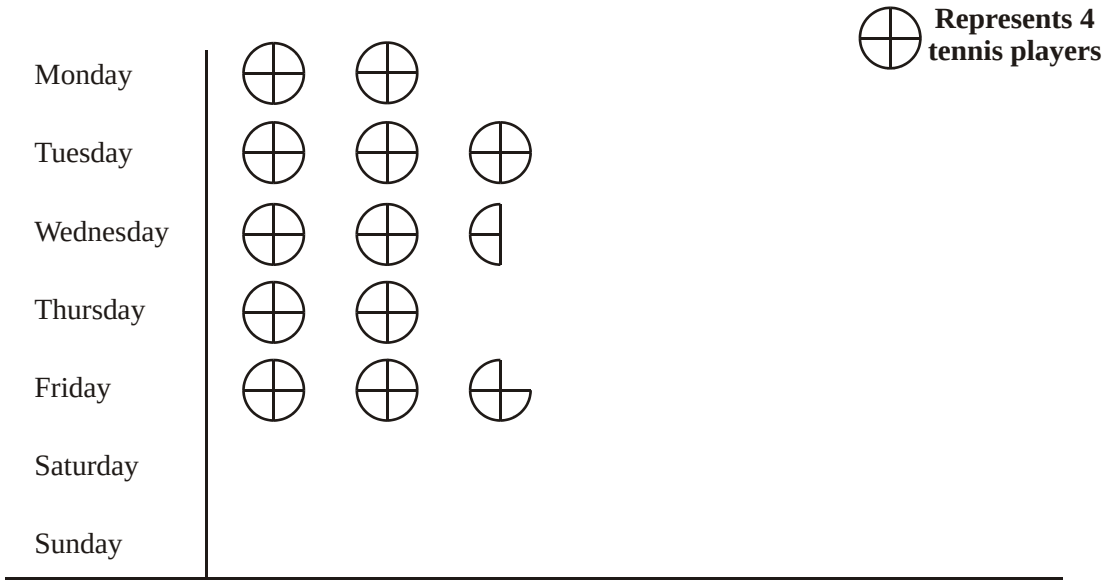
STATISTICS

1. 20 students took a short test.
The table gives information about their marks in the test.

Mark	Frequency	
7	1	
8	4	
9	6	
10	9	

Work out the mean mark. [10]

2. Here is a pictogram showing the number of tennis players who played at the local tennis club last week.



(a) Write down the number of tennis players who played on

(i) Tuesday, [Ans: 12]

(ii) Wednesday [Ans: 10]

On Saturday 20 tennis players played at the club.

(b) Show this on the pictogram.

3. 22 students took a short test.
The table gives information about their marks in the test.

Mark	**Frequency**	
7	1	
8	6	
9	5	
10	10	

(a) Write down the modal mark. [Ans: 10]

(b) Work out the range of the marks. [Ans: 3]

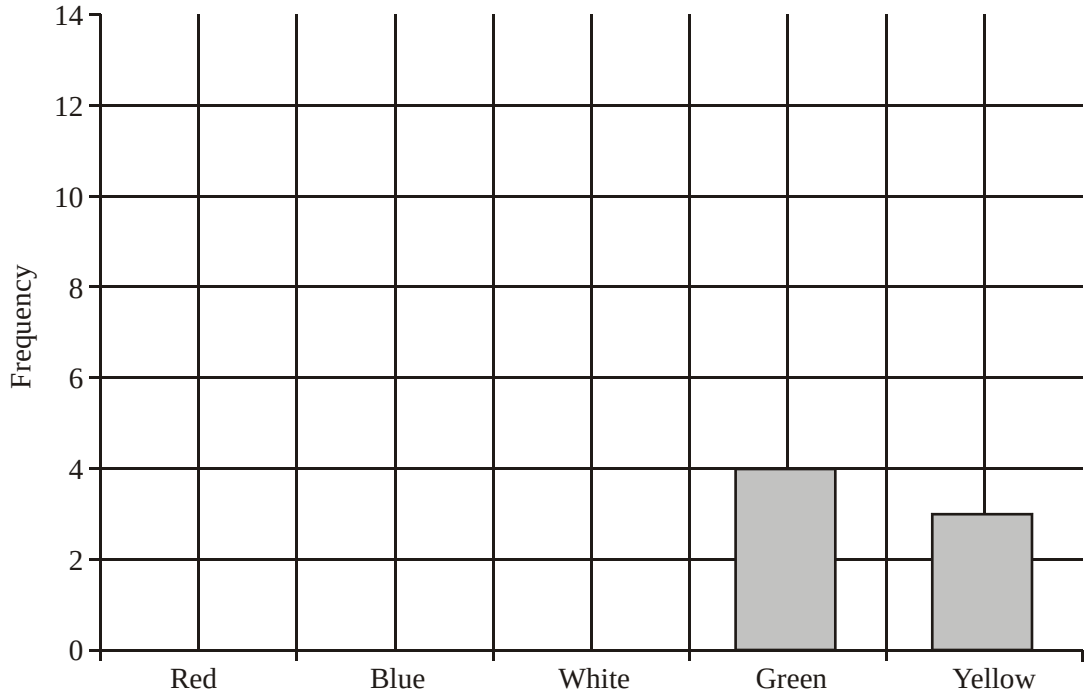
(c) Work out the mean mark. [Ans: 9.09]

4. Simon did an investigation into the colours of shirts worn by some football teams.
He recorded the colour of the shirts for each team.
There were only five different colours.
Simon then drew a frequency table and a bar chart.
Part of Simon's frequency table is shown below.

Colour	**Tally**	**Frequency**
Red	𝍸 𝍸 ||	……
Blue	𝍸 |||	……
White	𝍸	……..

(a) Complete the frequency column for the three colours in Simon's frequency table.

Part of Simon's bar chart is shown below.



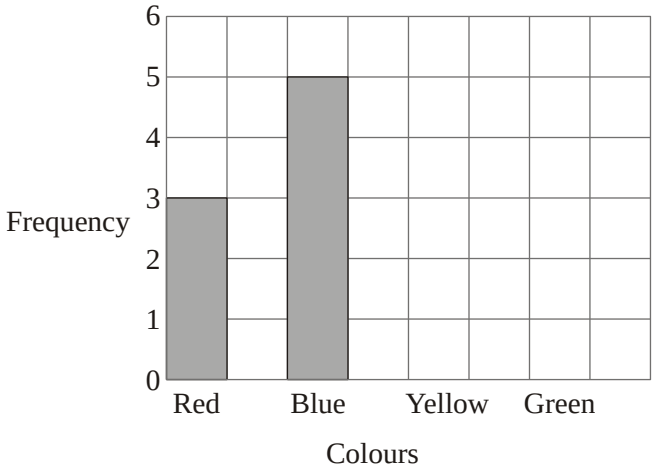
(b) Complete the bar chart for the colours Red, Blue and White.

(c) Which colour was the mode for the shirts of the football teams in Simon's investigation?

(d) Work out the number of football teams in Simon's investigation.

5. Clare drew a bar chart of her teachers' favourite colours.

Part of her bar chart is shown below.



4 teachers said that Yellow was their favourite colour.
2 teachers said that Green was their favourite colour.

(b) Complete Clare's bar chart.

(c) Which colour was the mode for the teachers that Clare asked

(d) Work out the number of teachers Clare asked.

6. Andy did a survey of the number of cups of coffee some pupils in his school had drunk yesterday.

The frequency table shows his results.

Number of cups of coffee	Frequency
2	1
3	3
4	5
5	8
6	5

Work out the number of pupils that Andy asked. [Ans: 101]

7. Musonda asked some people which region their favourite football team came from. The table shows her results.

Region	Frequency	
Ndola	22	
Kitwe	36	
Kabwe	8	
Lusaka	24	

Draw the pie chart showing the above information.

8. Nkana Football Club plays in the premier league. Mbala Council Football Club plays in Division III. Both teams won their last 14 games. If the two teams play each other in the BP challenge cup. Would you agree that the teams are equally likely to win?

Ans; No, teams in the premier league are much more competitive and skilled than those who play in Division III.

9. Bwalya tosses two dice and adds the scores. He repeats the trial 20 times. His outcomes are as follows: 7,5,8,7,6,5,7,10,6,5,6,7,8,6,7,5,7,8,8,11

Calculate the experimental probability of the following events

a) A={total 7}
b) B={ total is prime number}
c) C={total is a factor of 70}

Ans; Frequencies of outcomes: 5:4, 6:5, 7:6, 8:3, 10:1, 11:1 total 20

a) P(A) = $\frac{6}{20} = 0.3\ OR\ 30\%$
b) P(B) = $\frac{11}{20} = 0.55\ OR\ 55\%$
c) P(C)= $\frac{11}{20} = 0.55\ OR\ 55\%$

10. A dice is thrown once. Calculate probability of the following events.
a) A = {4}
b) B = {factor of 8}

c) C = {prime factor of 12}

Ans; S ={ 1,2,3,4,5,6}

a) P(A)= $\frac{1}{6} = 0.167\ OR\ 16.7$

b) P(B) = $\frac{3}{6} = \frac{1}{2} = 0.5\ OR\ 50\%$

c) P(C) = $\frac{2}{6} = \frac{1}{3} = 0.333\ OR\ 33.3\%$

11. If a dice is fair, define an event with the following theoretical probability.

a) P(event M)=0

b) P(event C)=50%

c) P(event F)=1

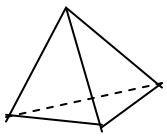
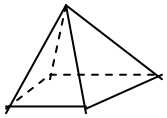
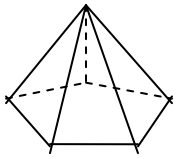
Ans; a) A = {scoring 7}

b) B= {scoring an odd number}

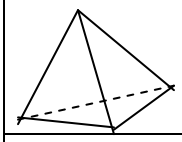
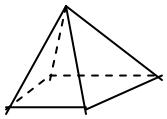
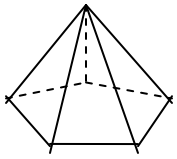
c) C= {scoring less than 7}

QUESTIONS ON SOLID SHAPES

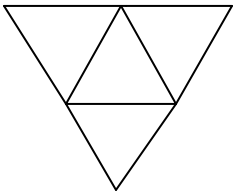
12. Copy and complete the table

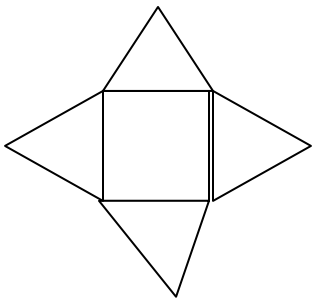
Shapes	Name	Number of corners	Number of faces	Number of edges
				
				
				

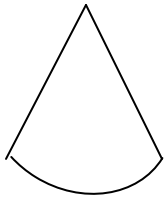
Ans;

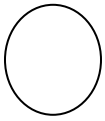
Shape	Name	Number of corners	Number of faces	Number of edges
	Triangular pyramid	4	4	6
	Square pyramid	5	5	8
	Pentagonal pyramid	6	6	10

13. Say which solids will be formed from these nets

a) 

b) 

c) 



Ans: a) triangular pyramid

b)square pyramid

c)cone

MATRICES

Definition: A matrix is a rectangular array of numbers arranged in rows and columns.

ORDER OF A MATRIX

Give the order of the following matrices

(a) $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ (b) (4 5 2) (c) $\begin{pmatrix} -7 & 0 \\ 9 & 1 \end{pmatrix}$

SOLUTIONS

(a) 2 by 1 or 2 x 1 (b) 1 by 3 or 1 x 3 (c) 2 by 2 or 2 x 2

ADDITION AND SUBTRACTION

Work out the following matrices

(a) $\begin{pmatrix} 1 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ (b) $\begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix} + \begin{pmatrix} 1 & 0 \\ 5 & 4 \end{pmatrix}$

© $\begin{pmatrix} 5 \\ 0 \end{pmatrix} - \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & 0 \\ 5 & 4 \end{pmatrix} - \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$

Solutions

(a) $\begin{pmatrix} 3 \\ 7 \end{pmatrix}$ (b) $\begin{pmatrix} 4 & 1 \\ 5 & 6 \end{pmatrix}$ (c) $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ (d) $\begin{pmatrix} -2 & -1 \\ 5 & 2 \end{pmatrix}$

MULTIPLICATION OF A MATRIX BY A SCALAR

Given that A = $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and B = $\begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix}$

Find (a) 2A (b) 3A (c) 2B

Solutions

(a) 2A = $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$ (b) 3A = $\begin{pmatrix} 6 \\ 3 \end{pmatrix}$ (c) 2B = $\begin{pmatrix} 4 & 6 \\ 2 & 0 \end{pmatrix}$

MULTIPLICATION

(i) If A = $\begin{pmatrix} 3 & 5 \\ 4 & 2 \end{pmatrix}$ and B = $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$, find AB.

Solution

AB = $\begin{pmatrix} 3 \times 1+5 \times 0 \\ 4 \times 1+2 \times 0 \end{pmatrix}$

AB= $\begin{pmatrix} 3+0 \\ 4+0 \end{pmatrix}$

AB = $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

(ii)Given that P = $\begin{pmatrix} 3 & 4 \\ 0 & 2 \end{pmatrix}$ and Q = $\begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, find PQ

Solution

PQ = $\begin{pmatrix} 3 \times 1 + 4 \times 3 & 3 \times 2 + 4 \times 1 \\ 0 \times 1 + 2 \times 3 & 0 \times 2 + 2 \times 1 \end{pmatrix}$

PQ = $\begin{pmatrix} 3 + 12 & 6 + 4 \\ 0 + 6 & 0 + 2 \end{pmatrix}$

PQ = $\begin{pmatrix} 15 & 10 \\ 6 & 2 \end{pmatrix}$