**SECTION A (30 MARKS)**

ANSWER **ALL** QUESTIONS

**Full mark**

**Question 1** **[30]**

**For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there is more than one choice circled, NO score will be awarded.**

| Criteria | Marks |
|---|---|
| Circles the correct option | 2 |
| Circles more than ONE alternative | 0 |
| Circles none of the alternatives | 0 |

i. What is the equivalent value for the expression $2 \times 10^{-6} + 3 \times 10^{-3} + 2 \times 10^{2}$ ?

(A) **200.003002**

B 20.003002

C 2.020302

D 0.023002

***Solution**: 0.000002+ 0.003+200= 200.003002*

ii. The average distance between Earth and Mars is about $1.52 \times 10^{8}$ km. It can also be expressed as

A 15,200,000 km.

(B) **152,000,000 km.**

C 1,520,000,000 km.

D 15,200,000,000 km.

***Solution***: $1.52 \times 100{,}000{,}000 = 152{,}000{,}000$

iii. A square field has an area of 4900 $m^2$. What will be its perimeter?

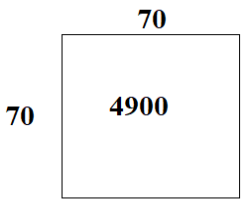
A 49 m.

B 70 m.

(C) **280 m.**

D 298 m.

***Solution***




**a= 70**
**P= 4a**
**P= 4 x 70= 280**

iv. The average mileage of different cars and their distance travelled is given in the table below.

| Car | Mileage (km per litre of fuel) | Distance (km) |
|---|---|---|
| I | 20 | 240 |
| II | 16 | 208 |
| III | 18 | 252 |
| IV | 22 | 275 |

Which statement below is true based on information given in above table?

A Car I consumed more than car II

B Car II consumed minimum petrol

**Ⓒ Car III consumed maximum petrol**

D Car IV consumed maximum petrol

***Solution***:

| Car | Mileage | Distance (km) | *Fuel consumption* |
|---|---|---|---|
| I | 20 | 240 | $\frac{240}{20} = 12\ l$ |
| II | 16 | 208 | $\frac{208}{16} = 13\ l$ |
| III | 18 | 252 | $\frac{252}{18} = 14\ l$ |
| IV | 22 | 275 | $\frac{275}{22} = 12.5\ l$ |

v. A sales person is paid monthly salary of Nu 12,000 with 5% commission on sales up to Nu 30,000 and 3% on the sales exceeding Nu 30,000. The next month, the sales person sets earning target of Nu 19,500. What must be the total sale amount to achieve this target?

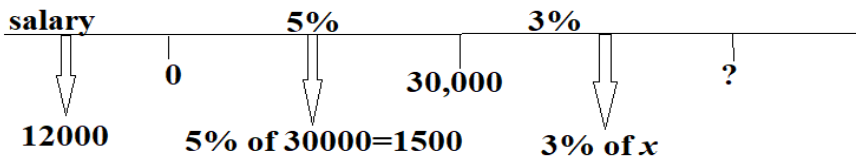
A Nu 9,600.

B Nu 37,500.

C Nu 200,000.

**Ⓓ Nu 230,000.**

***Sample solution:***




*12000+1500+0.03x=19500*

*0.03x=6000*

*x= 200000*

***Therefore sale amount must be 200000+30000= 230000***

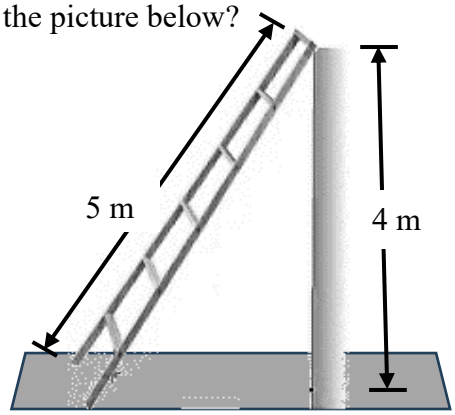
vi. What will be the slope of the ladder given in the picture below?

A $\frac{4}{5}$

**B** $\frac{4}{3}$

C 4

D 5




***Solution***

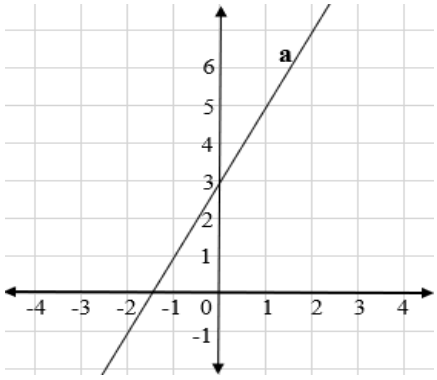
*slope* $= \frac{rise}{run}$

*here rise= 4m but run is not shown*

*Using pytahgoras theorem we get run = 3m*

*Therefore slope* $= \frac{4}{3}$

vii. Which of the following equation represents line '**a**' given in the graph below




A $y = x + 3$

**B** $\boldsymbol{y = 2x + 3}$

C $y = 2x + 1.5$

D $y = 2x - 1.5$

***Sample Solution***

general equation of line is given by $y = mx + b$

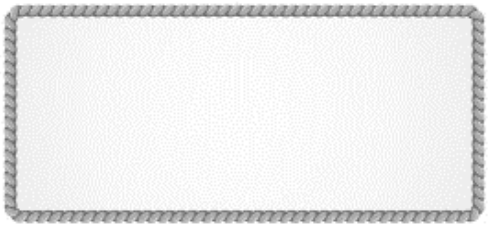
here $b = 3$…..so only A and B are possible solution

taking any $x$ value from $x$ axis of graph and substituting (say $x = 1$) then $y = 2 \times 1 + 3$

$y = 5$

Therefore $y = 2x + 3$ represents the line

viii. A 30 m long rope was bent to form a rectangle such that its side lengths were in whole numbers.



Which of the following is the possible area covered by the rope?

A 15 $m^2$

B 30 $m^2$

**C 44 $m^2$**

D 60 $m^2$

***Sample Solution:***

P= 30 cm so possible whole number dimensions are (1,14), (2,13), (3,12) (4,11) (5,10), (6,9), (7,8)

Area is product of dimension. So possible Areas are

( 1×14=14), ( 2×13=26), ( 3×12=36), **( 4×11=44)**, ( 5×10=50),(6×9=54), (7×8=56)

ix. Wheel cover of a car with an area of 154 $cm^2$ is damaged.

What should be the diameter of cover so it exactly fits into the wheel?

A 5.5 cm

B 7.5 cm

C 12.0 cm

Ⓓ **14.0 cm**

***Solution***

A= 154 $\pi r^2 = 154$

using $\pi = \frac{22}{7}$, we get r= 7. And Diameter= 14 cm

x. Which of the following set is the side lengths of a right-angled triangle?

A 1, 2, 3

B 3, 5, 9

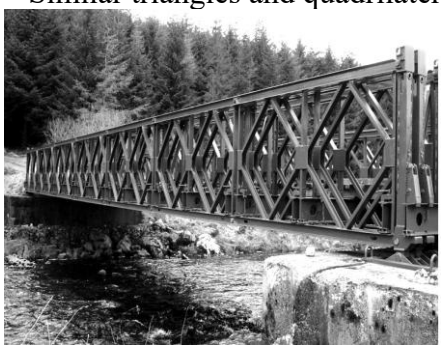
C 6, 9, 12

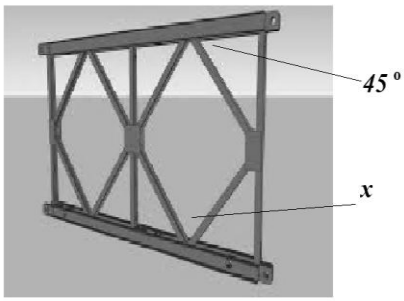
Ⓓ **9, 12, 15**

***Solution:***

The set that satisfy Pythagorean theorem is 9,12,and 15 (Pythagorean triple)
( i.e $9^2+12^2=15^2$)

xi. Similar triangles and quadrilaterals are used to build truss of a baily bridge.





What could be the measure of angle $x$ shown above on the truss?

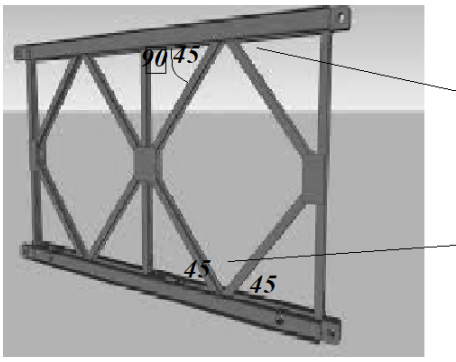
A 45°

B 60°

C **90°**

D 135°

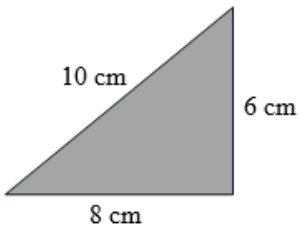
***Solution:***




**x+ 45+45=180**

**x=90**

xii. The triangle shown below is dilated with a scale factor of 1.5. Which set represents the lengths of the sides of the dilated triangle?




A **9 cm, 12 cm, 15 cm**

B 4 cm, 5.33 cm, 6.67 cm

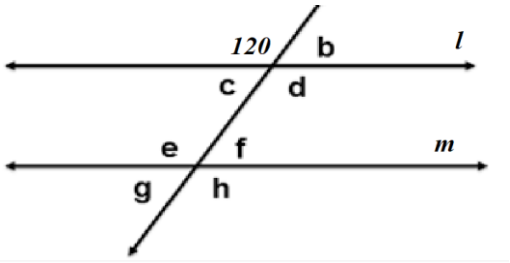
C 6 cm, 8 cm, 10 cm

D 7.5 cm, 9.5 cm, 11.5 cm

***Solution***

$1.5 \times [6 \;\; 8 \;\; 10] = [9 \; 12 \; 15]$.

xiii. Line '$l$' and '$m$' are parallel lines cut by a transversal and one of the angles formed is 120°.




Which of the following option is true about other angles?

A $\angle b = 120^o$

B $\angle e = 60^o$

C $\angle d + \angle f = 120^o$

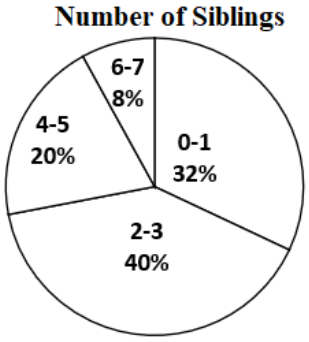
**D** $\boldsymbol{\angle b + \angle d = \angle d + \angle f}$

***Solution:***

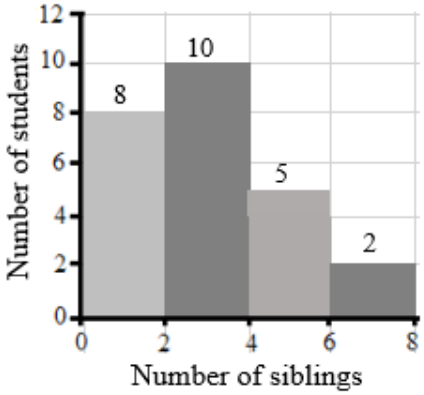
*Recalling the angles formed we know*

- *angles on straight line is 180* ➔$\angle b \neq 120^o$ ➔ *choice A is Not true*
- *complementary angles are equal* ➔ *angle e must be 120º* ➔ *choice B is Not true*
- *Interior angles are supplementary* ➔ $\angle d + \angle f = 180^o$ ➔ *Choice C is Not true*
- $\boldsymbol{\angle b + \angle d = 180^o ----angle\ on\ staright\ line}$
- $\boldsymbol{\angle d + \angle f = 180^o --interior\ angles\ are\ supplementary}$

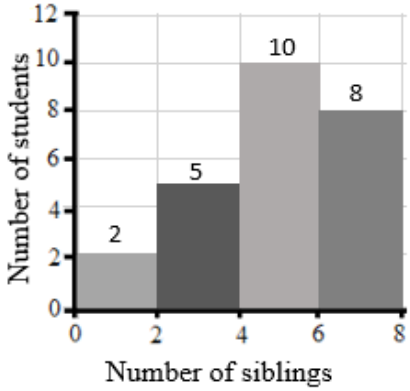
xiv. The circle graph below represents a survey in a class.



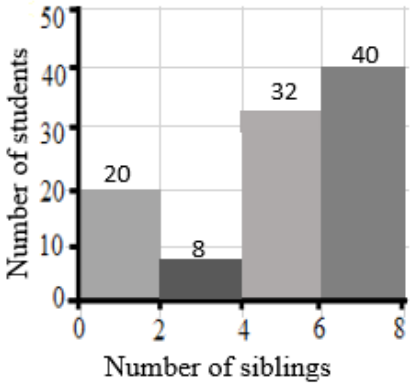

Which of the histogram below represents the same data as shown in the circle graph below?



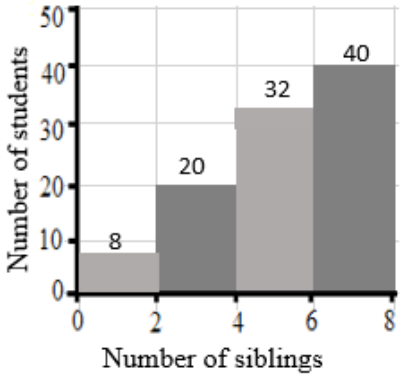

Ⓐ




**B**




**C**

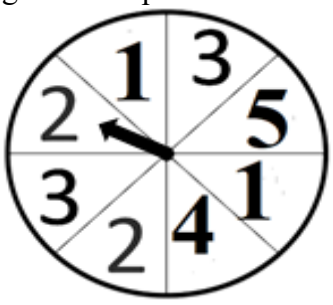



**D**

***Solution***

| *Question* | | *A* | | *B* | | *C* | | *D* | |
|---|---|---|---|---|---|---|---|---|---|
| *Sib-lings* | *per-cent* | *people* | *per-cent* | *people* | *per-cent* | *people* | *per-cent* | *people* | *per-cent* |
| *0-1* | *32* | *8* | *32* | *2* | *8* | *20* | *20* | *8* | *8* |
| *2-3* | *40* | *10* | *40* | *5* | *20* | *8* | *8* | *20* | *20* |
| *4-5* | *20* | *5* | *20* | *10* | *40* | *32* | *32* | *32* | *32* |
| *6-7* | *8* | *2* | *8* | *8* | *32* | *40* | *40* | *40* | *40* |
| *Total* | *40* | *25* | | *25* | | *100* | | *100* | |
| *Therefore Choice A matches with question ( pie chart )* | | | | | | | | | |

xv. The complementary probability of spinning 2 in the spinner below is




A $\frac{2}{5}$

B $\frac{2}{8}$

C $\frac{4}{5}$

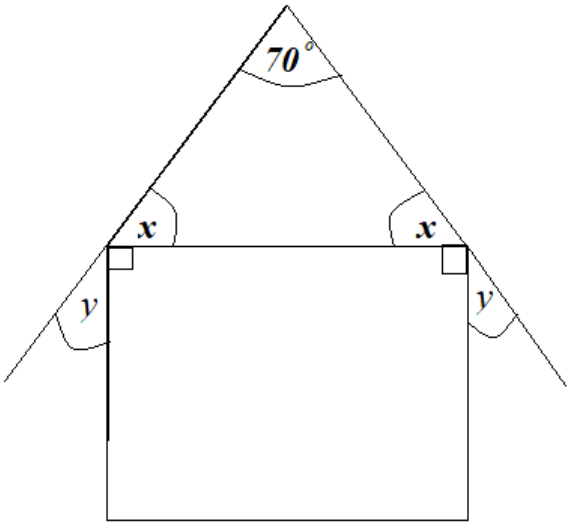
Ⓓ $\frac{6}{8}$

***Solution :***

*Total sectors= 8*

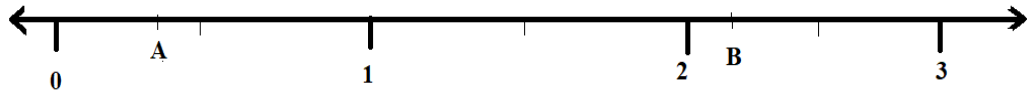
*Total 2s = 2*

*Numbers wihc are Not 2s=6. Therefore P (Not 2)=* $\frac{6}{8}$

| | |
|---|---|
| ***OR*** $P(2) = \frac{2}{8}$ *so P (Not 2)* $= 1 - \frac{2}{8} = \frac{6}{8}$ | |
| | |
| **SECTION B (50 MARKS)**<br>ANSWER **ALL** QUESTIONS | |
| **Question 2** | |
| a) Calculate angle $\boldsymbol{x}$ and $\boldsymbol{y}$ in the given diagram   | **[2]** |

| | | | |
|---|---|---|---|
| | ***Sample Response*** | | |
| 1 | using the property that sum of all interior angles in any triangle is 180º | $x + x + 70 = 180$ | **[0.5]** |
| 2 | calculating '$x$' | $2x + 70 = 180$<br>$2x = 110$<br>$x = 55o$ | **[0.5]**<br>*(if these steps are shown without showing step 1, then directly 1 mark can be awarded)* |
| 3 | using property that straight line is 180º ; the angle in rectangle is 90º and substituting angle $x$ | $x + y + 90 = 180$<br>$55 + y + 90 = 180$ | **[0.5]** |
| 4 | calculating '$y$' | $y + 145 = 180$<br>$y = 35o$ | **[0.5]** *( if these steps are shown without showing step 1, then directly 1 mark can be awarded)* |

b) Point A and B were placed in a number line.



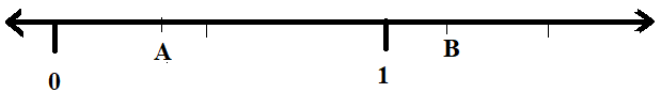

The numbers were: A= $\frac{1}{2} \times \frac{3}{6} + \frac{2}{5} \div 4$ and B= $\left(\frac{2}{3} + \frac{1}{5} - \frac{1}{2}\right) + \frac{5}{6}$

i) Solve them and find which point is **NOT** in correct place **[2]**

| | | | |
|---|---|---|---|
| | ***Sample Response*** | | |
| 1 | solving A | $\frac{1}{2} \times \frac{1}{2} + \frac{2}{5} \times \frac{1}{4}$<br>$\frac{1}{4} + \frac{1}{10} = \frac{5+2}{20} = \frac{7}{20}$ ***OR*** *0.35* | **[1]** |
| 2 | Solving B | $\left(\frac{20+6-15}{30}\right) + \frac{5}{6} = \frac{11}{30} + \frac{5}{6} = \frac{36}{30}$ ***OR*** *1.2* | **[1]** |

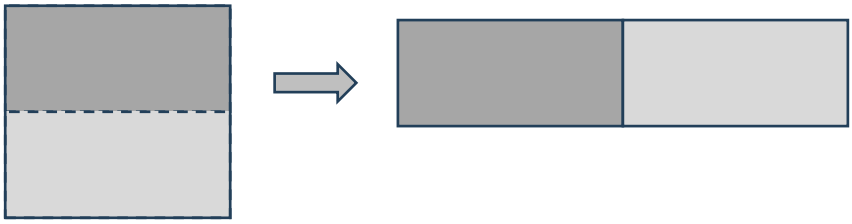
ii) Draw the number line placing both points in correct place. **[1]**

***Sample Response***

| | | | |
|---|---|---|---|
| 1 | Redrawing and placing |   | **[0.5 each]** |

**Question 3**

a) A square sheet with side length of 10 cm is cut from middle and joined along its side.



i) Calculate and find what has happen to its area? **[1]**

| | ***Sample Response*** | | |
|---|---|---|---|
| 1 | Calculating Area | *Original Area* = $10 \times 10 = 100\ m^2$<br>*New Area* = $20 \times 5 = 100\ m^2$ | **[0.5]** |
| 2 | Conclusion | *The area remains same .* | **[0.5]** |

ii) Calculate and find what has happen to its perimeter? **[1]**

| | ***Sample Response*** | | |
|---|---|---|---|
| 1 | Calculating perimeter | *Original Perimeter* = $4 \times 10 = 40\ m$<br>*New Perimeter* = $2(20 + 5) = 50\ m$ | **[0.5]** |
| 2 | Conclusion | *The area remains same but the perimeter increases.* | **[0.5]** |

b) Electromagnetic waves are categorized into seven types based on their wavelength. Long exposure to wavelength less than 300 nanometers is usually harmful.

(1 nanometer = $1.0 \times 10^{-9}$meter)

| Electromagnetic ( EM) Waves | Wavelength |
|---|---|
| Type I | $3.0 \times 10^{0}$ to $3.0 \times 10^{3}$ |
| Type II | $1.0 \times 10^{-2}$ to $1.0 \times 10^{1}$ |
| Type III | $7.5 \times 10^{-7}$ to $1.0 \times 10^{-2}$ |
| Type IV | $4.0 \times 10^{-7}$ to $7.0 \times 10^{-7}$ |
| Type V | $1.0 \times 10^{-8}$ to $4.0 \times 10^{-7}$ |
| Type VI | $1.0 \times 10^{-10}$ to $1.0 \times 10^{-8}$ |
| Type VII | $1.0 \times 10^{-12}$ to $1.0 \times 10^{-10}$ |

i) Which type of EM waves should we avoid? How do you know? **[2]**

| ***Sample Response*** | | | |
|---|---|---|---|
| 1 | Identifying harmful waves | *Type V, Type VI and Type VII are harmful* | **[0.5 each]** |
| 2 | Reasoning | *because their wavelength is less than* $3.0 \times 10^{-7}$ | **[0.5]** |

ii) EM waves with wavelength about 500 nanometers are visible to our eyes. Which type is visible? How do you know? **[1]**

| ***Sample Response*** | | | |
|---|---|---|---|
| 1 | Identifying visible waves | *Type IV is the visible* | **[0.5]** |
| 2 | Reasoning | *because 500 nanometers is between* $4.0 \times 10^{-7}$ to $7.0 \times 10^{-7}$ | **[0.5]** |

**Question 4**

a) There are different properties of multiplication which can be applied to get products. What property is applied in each of multiplication below?

i) $24 \times -2 = (20 + 4) \times -2$

$= (-2 \times 20) + (-2 \times 4)$ **[1]**

| | | | |
|---|---|---|---|
| ***Sample Response*** | | | |
| 1 | recognizing property | *Distributive property* | **[1]** |

ii) $-25 \times 8 = -50 \times 4$ **[1]**

| | | | |
|---|---|---|---|
| ***Sample Response*** | | | |
| 1 | recognizing property | *doubling and halving* | **[1]** |

b) Dorji had Nu 65 and Dhan Bdr had Nu 30. They save Nu 5 and Nu 10 per day, respectively.

i) On which day will they have the same amount saved? **[1.5]**

| marking criteria | | | |
|---|---|---|---|
| i | Correct equation | $65 + 5x = 30 + 10x$ | **[0.5]** |
| i | Finding the day | $65 - 30 = 10x - 5x$<br>$5x = 35$<br>$x = 7$ | **[ 1 ]** |

ii) Predict who will have more savings on 9th day. **[1.5]**

| marking criteria | | | |
|---|---|---|---|
| ii | Finding the value | Dorji = $65 + 5x = 65 + 5(9) = 110$<br>Dhan Bdr = $30 + 10x = 30 + 10(9) = 120$ | **[ 1 ]** |
| ii | predicting | Dhan Bdr will have more savings on $9^{th}$ day. | **[0.5]** |

**Question 5**

a) Two numbers are $(5 \times 10^{-3} + 2 \times 10^{-4} + 3 \times 10^{-2})$ and $0.0052$. **[2]**
Which number is greater? By how much?

***Sample Response***

| | | | |
|---|---|---|---|
| 1 | Converting | *0.0352 □ 0.0052* | **[0.5]** |
| 2 | Comparing | *0.0352 >0.0052* | **[0.5]** |
| 3 | Subtraction | $0.0352 - 0.0052 = 0.03$ | **[0.5]** |
| 4 | Answer | $5 \times 10^{-3} + 2 \times 10^{-4} + 3 \times 10^{-2}$ *is greater by 0.03* | **[0.5]** |

b) How is the volume affected, if the length and width of a rectangular prism is doubled? Show your work with an example. **[3]**

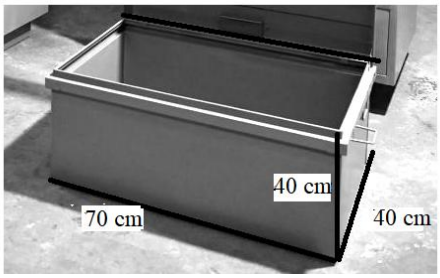
| ***Sample Response*** | | | |
|---|---|---|---|
| 1 | Original volume | *Let the l= 2, w=3, h= 5*<br>*Base Area* = $(l \times w) = 2 \times 3 = 6\ cm^3$<br>*Volume* = $(BA \times h) = 6 \times 5 = 30\ cm^3$ | **[0.5]** |
| 2 | Double the *l* and *w*<br><br>volume | *When we double the l and w*<br>*l=4, w = 6, h=5*<br>*Base Area* = $(l \times w) = 4 \times 6 = 24\ cm^3$<br>*Volume* = $(BA \times h) = 24 \times 5 = 120\ cm^3$ | **[0.5]**<br><br>**[1]** |
| | Conclusion about the volume | *The Base Area becomes 4 times larger, hence, the volume also becomes 4 times larger than the original volume.* | **[1]** |

**Question 6**

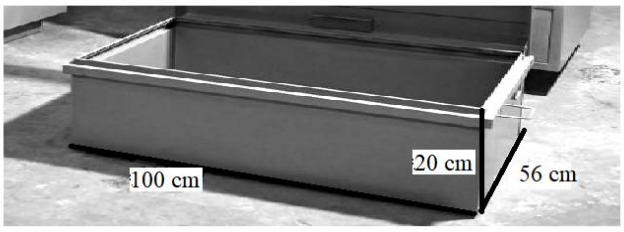
a) A dealer marks his good 10% above cost price and offers 10% discount. Assume a cost price and calculate profit or loss percent. **[2]**

| ***Sample Response*** | | | |
|---|---|---|---|
| 1 | assuming CP | *let CP = 100* | |
| 2 | mark up % ( given) | *10%* | |
| 3 | Marked price | *100 + 10 % of 100= 110*<br>*OR*<br>*100 +(0.1 * 100)= 110* | **[0.5]** |
| 4 | discount % ( given) | *10%* | |
| 5 | Sale price | *110- (10 % of 110)= 99*<br>*OR*<br>*110- ( 0.1* 110)=* | **[0.5]** |
| 6 | loss | *100-99= 1* | |
| 7 | 1oss % | $\frac{1}{100} \times 100$= *1%* | **[1]** |

b) Khandu painted two containers as shown below. Which of the two containers required less paint? Show your work. **[3]**




Container A




Container B

| marking criteria | | | |
|---|---|---|---|
| 1 | calculating Surface area | Container A: $2((70 \times 40) + (40 \times 40) + (70 \times 40)) = 14400\ cm^2$ | **[1]** |
| 2 | calculating Surface area | Container B: $2((100 \times 20) + (20 \times 56) + (100 \times 56)) = 17440\ cm^2$ | **[1]** |
| 3 | Decision | Container A requires less paint | **[1]** |

**Question 7**

a) A rectangular garden is $(3x + 2)$ m long and $(2x + 5)$ m wide. Find the perimeter of the garden in terms of $x$? **[2]**

| *Sample Response* | | | |
|---|---|---|---|
| 1 | Substituting values in Perimeter formula | $l = 3x + 2,\ w = 2x + 5$<br>$P = 3x + 2 + 3x + 2 + 2x + 5 + 2x + 5$ | **[1]** |
| 2 | addition | $=10x + 14$ | **[1]** |

b) A deck of cards contains four suits (Club, Diamond, Heart and Spade). In each suit there is 1 Ace, 3 face cards and 9 number cards.

i) What is the probability of selecting a face card? **[1]**

| *Sample Response* | | | |
|---|---|---|---|
| 1 | probability | *Number of favorable outcomes = 12*<br>*Number of possible outcomes= 52*<br>$P(E) = \frac{12}{52}\ OR\ \frac{3}{13}$ | **[1]** |

ii) What is the probability of **NOT** selecting a face card? **[1]**

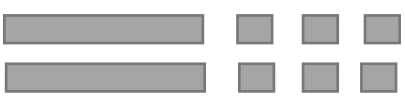
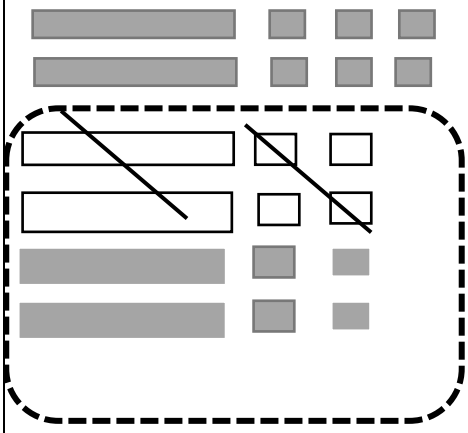
| *Sample Response* | | | |
|---|---|---|---|
| 1 | probability | $P(Not\ E) = 1 - \frac{12}{52}\ \ OR\ 1 - \frac{3}{13}$<br>$= \frac{40}{52}\ \ OR\ \ \frac{10}{13}$ | **[1]** |

iii) What is the complement event of selecting a club? **[1]**

| *Sample Response* | | | |
|---|---|---|---|
| 1 | Any of the two | -**NOT** selecting a club<br>**OR**<br>-selecting a heart or a diamond or a spade | **[1]** |

**Question 8**

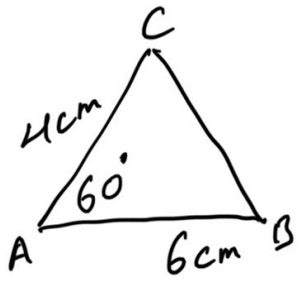
a) Subtract $(2x + 4)$ from $(-2x - 6)$. **[2]**

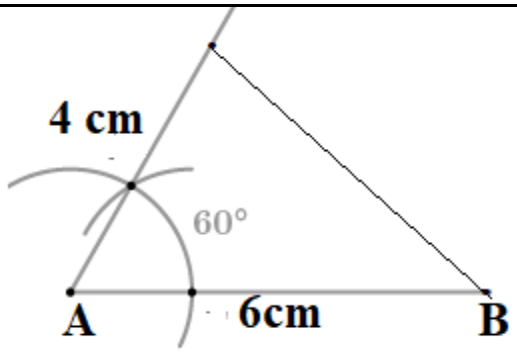
| *Sample Response I* | | | |
|---|---|---|---|
| 1 | Representing $(-2x - 6)$ with models |  | **[0.5]** |
| | taking out $(2x + 4)$ is not possible, so bringing zero pair to take out |  | **[1]** |
| | counting the remaining | ⇨ $-4x - 10$ | **[0.5]** |

**OR**

| *Sample Response II* | | | |
|---|---|---|---|
| 1 | comprehending meaning of take away | $(-2x - 6) - (2x + 4)$ | **[0.5]** |
| 2 | subtraction means adding opposite | $(-2x - 6) + (-2x - 4)$ | **[0.5]** |
| 3 | Adding them | ➔ $(-2x) + (-2x) - 6 + (-4)$<br>➔ $-4x - 10$ | **[1]** |

b) Construct a triangle ABC with AB= 6 cm, $\angle A = 60^0$ and side AC= 4 cm. **[3]**

| *Sample Response* | | | |
|---|---|---|---|
| 1 | rough sketch |  | **[0.5]** |

| | | | | |
|---|---|---|---|---|
| 2 | drawing 6 cm<br><br>constructing 60°<br><br>drawing 4 cm<br><br>completing and labelling |  | **[0.5]**<br><br>**[0.5]**<br><br>**[0.5]**<br><br>**[1]** | |

**Question 9**

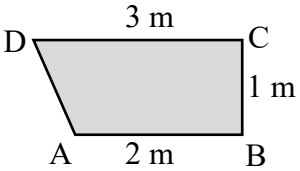
a) A boy is operating a set of numbers given below: **[2]**

$(2 + 3\frac{2}{5} + \sqrt{64} - 2) \div 5^2$

He got $11\frac{2}{5}$ as solution. Carry out the operations to check his solution.

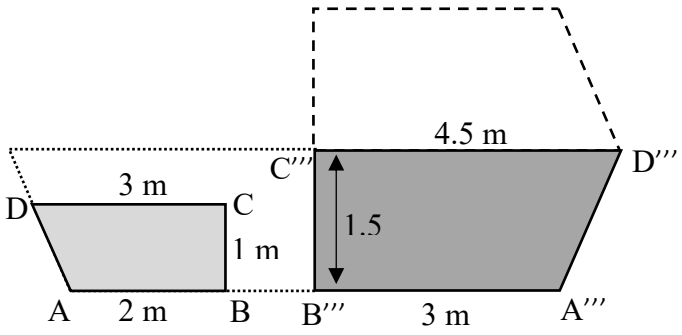
| | | | |
|---|---|---|---|
| | ***Sample Response*** | | |
| 1 | Using BEDMAS | $(2 + 3\frac{2}{5} + \sqrt{64} - 2) \div 5^2$ | |
| 2 | cancelling 2 | $(\cancel{2} + 3\frac{2}{5} + \sqrt{64} - \cancel{2}) \div 5^2$ | **[0.5]** |
| 3 | find square root, adding and changing to improper | $(3\frac{2}{5} + 8) = 11\frac{2}{5} = \frac{57}{5}$ | **[0.5]** |
| 4 | finding square & dividing and multiplying as inverse of division | $\frac{57}{5} \div 25$<br>$\frac{57}{5} \times \frac{1}{25} = \frac{57}{125}$ | **[0.5]** |
| 5 | Decision | His solution is not correct. | **[0.5]** |

b) The flower bed designed by landscape architect is as shown below.



i) Enlarge the bed applying the following combination of transformations. **[2]**

- Step 1: dilate it by a scale factor of 1.5 with dilatation center at A.
- Step 2: rotate $\frac{1}{2}$ turn with turn center at image of C.
- Step 3: reflect the flower bed across a longer base.

| | Sample Response | | |
|---|---|---|---|
| 1 | Dilatation<br><br>Rotation.<br><br>Reflect<br><br>Drawing final image<br><br>labelling |  | **[2]** (0.5 for each transformation, 0.5 for labelling and 0.5 for final image |

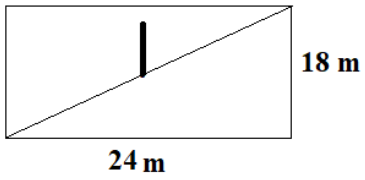
ii) Describe the changes in the dimensions or orientation of the final shape. **[1]**

| | Sample Response | | |
|---|---|---|---|
| 1 | Dimensions<br><br>Orientation | *The resulting flower bed after the combination of transformations will have new dimensions of Top base = 4.5 m, Bottom base = 3 meters, and Height = 1.5 m.*<br><br>*It will be enlarged mirror image of the original shape.* | **[0.5]**<br><br>**[0.5]** |

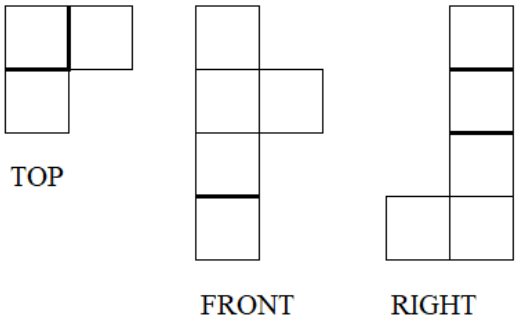
**Question 10**

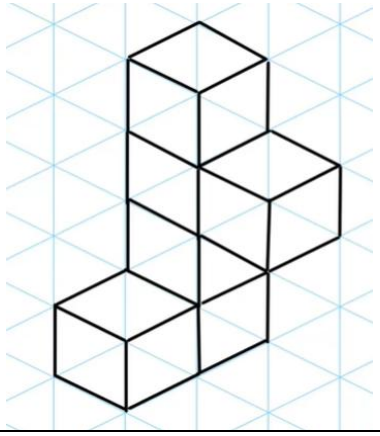
a) A pole is at center of 18 m by 24 m rectangular play field. How far is the pole from its corner? **[2]**

***Sample Response***

| | | | | |
|---|---|---|---|---|
| 1 | sketch |  | **[1]** | |
| 2 | finding the length of diagonal | *let the length of diagonal be* ***c***<br>*using Pythagorean theorem*<br>$c = \sqrt{a^2 + b^2}$<br>$c = \sqrt{18^2 + 24^2}$<br>$c = \sqrt{324 + 576}$<br>$c = \sqrt{900}$<br>*c=30 m* | **[1]**<br>( 0.5 for substitution and 0.5 for c=30) | |
| 3 | dividing the diagonal by 2 | $\frac{30}{2} = 15\ m$ | **[0.5]** | |

b) The following are orthographic face views of a structure made from linking cubes. Use the face views and create an isometric drawing **[3]**




| ***Sample Response*** | | |
|---|---|---|
| Isometric drawing |  | **[3]**<br>1 mark each for matching each face view |

**Question 11**

a) 200 students sat for mathematics test, 60% of the participants correctly solved a challenging problem.

i) Calculate the number of participants who solved the problem correctly **[1]**

| ***Sample Response*** | | | |
|---|---|---|---|
| 1 | Representing percent | $60\%\ of\ 200 = ?$ | **[0.5]** |
| | Solution | $\frac{60}{100} \times 200 = 120$ | **[0.5]** |

ii) 40 participants did not try the question. What percent of the total participants did this group represent? **[1]**

| ***Sample Response*** | | | |
|---|---|---|---|
| 1 | Representing fraction | $\frac{40}{200}$ *participants* | **[0.5]** |
| | Percent calculation | $\frac{40}{200} \times 100$ $= \frac{20}{100} = 20\%$ | **[0.5]** |

b) The data collected for 200 students is shown in the circle graph below. **[3]**

**Favourite Activities**

| | |
|---|---|
| Write three interpretations from the graph above. | |
| ***Sample Response*** | |
| • *Reading is the most preferred activity overall.*<br>• *Playing sports and playing video games are the next preferred activities.*<br>• *Gardening and painting have moderate preference levels.*<br>• *Biking is the least preferred activity.*<br>• *Indoor activities have a slightly higher preference than outdoor activities*<br>• ***(Any response appropriate to the chart above)*** | **[3]**<br><br>(1 mark each). |