Mock Dar solutions 2023

Qn1

a) To arrange the given fractions in descending order, we first need to find a common denominator. A good way to do this is by finding the least common multiple (LCM) of all the denominators.

The denominators are: 9, 11, 7, 4 and 3

To find the LCM of these numbers, we can do this by prime factors of given numbers

Prime factor of 9= 3×3

Prime factor of 11=11

Prime factor of 7=7

Prime factor of 4= 2×2

Prime factor of 3=3

LCM=3×3×11×7×2×2=2772

Since the LCM is 2772, we will multiply each fraction by 2772

$\frac{2}{9}\times 2772 = 616$…..............5

$\frac{5}{11}\times 2772$ =756................4

$\frac{2}{7}\times 2772$………...................3

$\frac{3}{4}\times 2772$=2079..................1

$\frac{1}{3}\times 2772$=925.....................2

So, the fractions in descending order are: 3/4, 1/3, 2/7, 5/11 and 2/9

1b. To simplify$\left(3\times 10^{-4}\right)\left(7.5\times 10^{-4}10\right)$

=$3\times 7.5\times 10^{-4}\times 10^{-4}$

$= 22.5\times 10^{-8} = 2.25\times 10^{1}\times 10^{-8}$

$= 2.25\times10^{1-8} = 2.25\times10^{-7}$

$\therefore(3\times10^{-4})\times(7.5\times10^{-4}) = 2.25\times10^{-7}$

Qn 2

a)given $\log_2(3y^2 +2) = \log_2(y^2+3y)$

$3y^2+2=y^2 +3y$

Rearange the variables

$3y^2 -y^2-3y+2=0$

$2y^2 -3y+2=0$

By using general quadratic formula

$Y=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

Where a=2, b=-3 and c=2

$y=\frac{-(-3)\pm\sqrt{-3^2-4\times2\times2}}{2\times2}$

$= \frac{3\pm\sqrt{9-4\times2\times2}}{2\times2}$

$= \frac{3\pm\sqrt{-7}}{4}$

The question cannot be solved because we do not have –ve root of 7

2b.solution

$requred\ to\ simplify\ \frac{6\sqrt{5}\times2\sqrt{3}}{\sqrt{20}\times3\sqrt{21}}$

$= \left(\frac{6\times2}{3}\right)\left(\sqrt{\frac{5\times3}{20\times21}}\right)$

$=4\left(\sqrt{\frac{1}{4}\times\frac{1}{7}}\right)$

$= 4\times\frac{1}{2}\times\frac{1}{\sqrt{7}} =\frac{2}{\sqrt{7}}$

Rationalize denominator

$\frac{2\sqrt{7}}{\sqrt{7}\times\sqrt{7}} = \frac{2\sqrt{7}}{7}$

$\therefore \frac{6\sqrt{5}\times2\sqrt{3}}{\sqrt{20}\times3\sqrt{21}} = \frac{2\sqrt{7}}{7}$

3a.solution

Let F- football

L-long jump

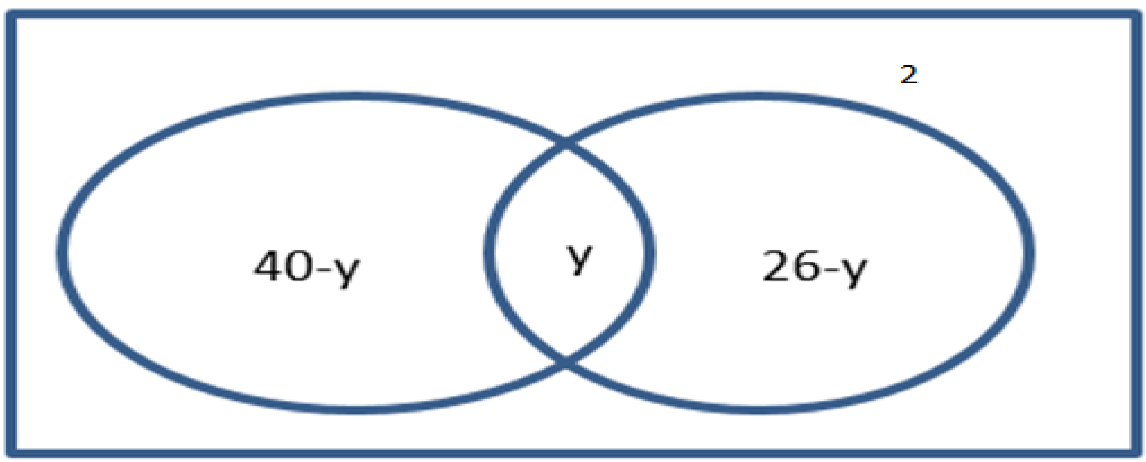
Given U=60

n(L)=40

n(L)=26

n(FuL)'=2

n(FnL)=?



By using Venn diagram

26-y+y+40-y+2=60

y=68-60

y=8

Therefore 8 students are both football fans and long jump fans

3b.solution

Given number of white ball and number of black ball

Let white be W and Black be B so

n(W)=3. n(B)=5

n(S)=8

P(W)=$\frac{3}{8}$.   P(B)=$\frac{5}{8}$

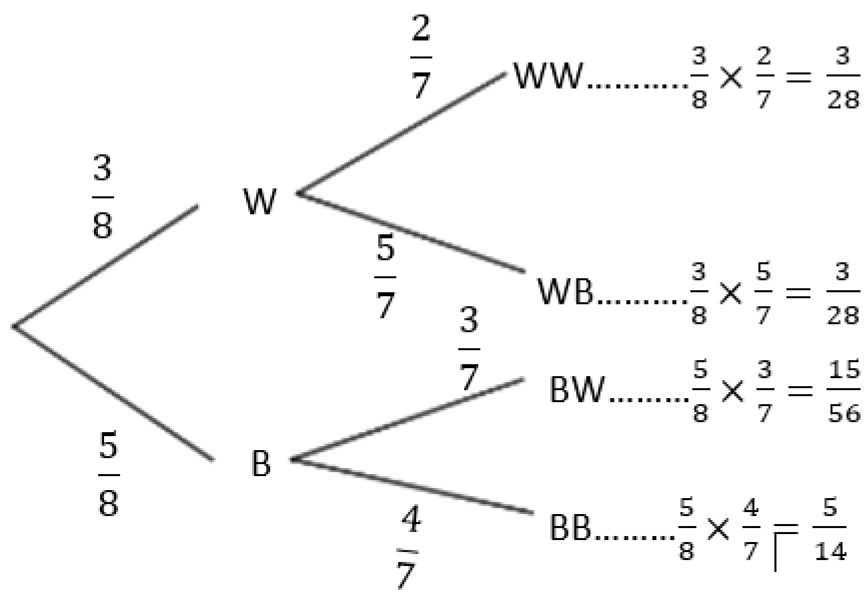
If Drawing of balls was done twice without replacement the following would be the sample space of the outcome

S={WW,WB,BW,BB}

Probability of Both of the same colour(P(WW or BB))=P(WW)+P(BB)

$=\left(\frac{3}{8} \times \frac{2}{7}\right) + \left(\frac{5}{8} \times \frac{4}{7}\right) = \frac{13}{28}$

Also, we can solve it by using tree Diagram



Then required probability of both balls of the same colour

P (WW or BB)= $\frac{3}{28} + \frac{5}{14} = \frac{13}{28}$

Therefore, the probability that both balls will be of the same colour is $\frac{13}{28}$

4.Given that a=2i+6j And B=3i+6j

Then c.=3a+b

=3(2i+6j)+(3i-6j)

6i+18j+3i-6j

=6i+3i+8j-6j

=9i+12j

C=9i+12j

4b .gradient (m)=3/2) y-i intercept=-3

From y=3x/2-6

2y=3x-6

2y-3x+6=0

Therefore equation is 2y-3x+6=0

QN5

Area of Trapezium A= $\frac{1}{2}h(a + b)$

$h = 2xcm$

$a = (x + 14)cm$

$a = (x + 2)cm$

$A_1 = \frac{1}{2}\times2x(x + 2 + x + 4)$

$A_1 = 2x^2 + 16x$

Area of triangle =$\frac{1}{2}bh$

$b = x + 14$

$b = x + 1$

$A_2 = \frac{1}{2}(x + 14)(x + 1)$

$A_2 = \frac{1}{2}(x^2 + 15x + 14)$

Total area= $A_1 + A_2$

$Total\ Area = 2x^2 + 16x + \frac{1}{2}(x^2 + 15x + 14)$

$\therefore A = (\frac{5}{2}x^2 + \frac{47}{2}x + 7)cm^2$

ii)$A = \frac{5}{2} \times 2^2 + \frac{47}{2}\times 2 + 7$

ii)$A = 10 + 47 + 7 = 64cm^2$

first rectangle

$l_1 = 10cm$

$w_1 = 5cm$

Second rectangle

$l_2 = 10cm$

$w_2 = 5cm$

For two rectangle to be similar

$\frac{l_1}{l_2} = \frac{w_1}{w_2}$

$\frac{10}{12} = \frac{5}{4}$

5/6≠5/6

Then the given two rectangles are not similar

QN6

Let the Remaining part of the string be $x - 8.54$

$\frac{x-8.54}{6} = 20$

$x - 8.54 = 20\times 6$

$x = 120 + 8.54$

$x = 128.54$

b soln

$p \, \alpha \frac{1}{A} \alpha \, T$

$p \, \alpha \frac{T}{A}$

Introduce proportionaty constant k

$p = \frac{kT}{A}$

$\therefore k = \frac{PA}{T}$

Given

$p = 20mmHg$

$p = 5\,°c$

$A = 4mm^2$

$k = \frac{20 \times 4}{5}$

$k = 16\,° \frac{c}{mm}$

Qn7 a)Magnesium:oxygen = 3:2

Then

M/1.4 = 3/2

2m = 4.2

m = 2.1

Mass of magnesium is 2.1 kg needed

7b .solution

Cost of goods sold=closing stock+net purchases-closing stock

=1,000,000+500000-100000=1,400,000

So the cost of goods sold=1,400,000

Net profit=gross profit-total expenses

Gross profit=2,500,000-1,400,000

Gross profit=1,100,000

Total expenses=wage+transport

=300,000+200,000=500,000

Net profit=1,100,000-500,000

Therefore net profit=Tsh 600,000

Qn 8. sum of first 5 terms=35 and Sum of last five terms=395

Required A and d

From $S_n=n/2(A_1+A_n)$

For the first five terms, n=5 and $A_n=A_5$ and $S_n=35$

$35=5/2(2A_1+4d)$ dividing by 5 through out

$A_1+2d=7$..................i

Sum of last five terms=395

From Sn=n/2(A1+An)

For the first five terms, n=5 and An=A_{41} and Sn=395 $A_1=A_{37}$

$S_n=n/2(A_{37}+A_{41})$

$395=5/2(A_1+36d+A_1+40d)$

$395=5/2(2A_1+76d)$ dividing by 5 through out

A1+38d=79..Ii

Solve eqn i and ii simultaneously

d=2 and $A_1=5$

8b.let the consecutive terms be G_1 G_2 and G_3

$G_1=P-2$

$G_2=P-1$

$G_3=P-5$

But

$G_2/G_1=G_3/G_2$

So

$(G_2)^2=G_1\times G_3$

$(P-1)^2=(P-2)(P-5)$

$P^2-2P+1=P^2-5P-2P+10$

Collect like terms

$P^2-P^2-2P+7P=10-1$

$5P=9$ divide by 5 both side

Therefore $P=1.8$ or $9/5$

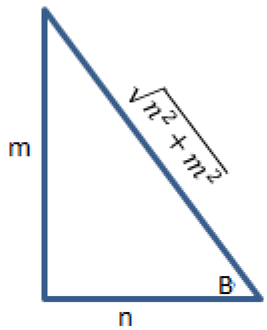
Qn9

Note Tan B = $\frac{opp}{adj}$

Consider right angled triangle below

$$(hyp)^2 = m^2 + n^2$$

$$hyp = \sqrt{m^2 + n^2}$$



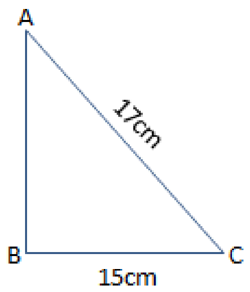
Sin B=$\frac{opp}{hyp} = \frac{m}{\sqrt{m^2+n^2}} \rightarrow \frac{m\sqrt{m^2+n^2}}{m^2+n^2}$

∴ sin B= $\frac{m\sqrt{m^2+n^2}}{m^2+n^2}$

∴Cos B= $\frac{adj}{hyp} = \frac{m}{\sqrt{m^2+n^2}} \rightarrow \frac{n\sqrt{m^2+n^2}}{m^2+n^2}$

Type equation here.

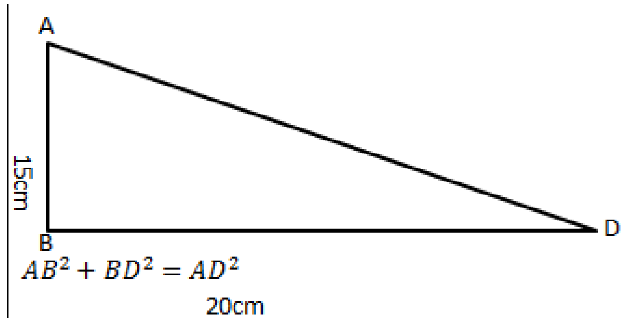
9 solution



$AB^2 + 8^2 = 17^2$

$AB = \sqrt{225}$

AB=15cm



$AB^2 + BD^2 = AD^2$

$15^2 + 20^2 = AD^2$

$625 = AD^2$

$\therefore AD = \sqrt{625}$

Qn10.let x be the present age of the son then the age of man will be 4x

in 4 years to come the age of son will be x+4 and the age of man will be 4x+4

Algebraic equation for the product of their age will be::(x+4)(4x+4)=520

$4X^2$+20X+16=520

Divide by 4 throughout

$x^2 + 5x + 4 - 130 = 0$

$x^2 + 5x - 126 = 0$

Obtain the value of x by using general formula

$x \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Where a=1 b=5 and c=-126

$x = \frac{-5 \pm \sqrt{5^2 - 4 \times 1 \times -126}}{2 \times 1}$

$= \frac{-5 \pm \sqrt{529}}{2}$

$x = \frac{-5 \mp 23}{2}$

$X=9$ or -14

Since the age can't be negative

Therefore the present age of the Son's is 9 years

10b.The area of trapezium is given by ½h(a+b)

Where a=(x+1)cm b=(x+5)cm and h= (x-1)

Area=$\frac{1}{2}(x-1)(x+1+x+5)cm^2$

$=\frac{1}{2}(x-1)(2x+6)cm^2$

$=\frac{1}{2}(2X^2+4x-6)cm^2=x^2+2x-3$

But area=$12cm^2$

$12cm^2=(x^2+2x-3)cm^2$

Then $X^2+2x-15=0$

By factorization method

$X^2+5x-3x-15=0$

$(x-3)(x+5)=0$

Therefore

$X=3$ or -5

But the side of any figure can't be -ve then the value of $x=3$

Qn 11.

I) 2+12+32+24+x+8=100

78+x=100

X=22

Ii)

Height	Frequency	Cum.frequency	d	fd
160	2	2	-10	-20
165	12	14	-5	-60
170	32	46	0	0
175	24	70	5	120
180	22	92	10	220
185	8	100	15	120

Let x_1 be lower limit and x_2 be upper limit

$(x_1+x_2)/2=160$

$x_1+x_2=320$............1

$x_2-x_1=4$…................2

Obtain the x_1 and x_2 by solving eqn 1and 2 simultaneously

So $x_1=158$ and $x_2=162$

By having limits we are able to add the column of class interval to the table as shown below

Class interval	Height(x)	Frequency	Cum.frequency	d=x-170	fd
158-162	160	2	2	-10	-20
163-167	165	12	14	-5	-60
168-172	170	32	46	0	0
173-177	175	24	70	5	120
178-182	180	22	92	10	220
183-187	185	8	100	15	120

12a Mogadishu $(19.5°N, 39.5°E) and\ mombasa (12.5°N, 39.5°E)$

$\pi = \frac{22}{7}\quad R = 6370\quad \theta = Difference\ in\ latitude = 19.5 - 12.5 = 7°$

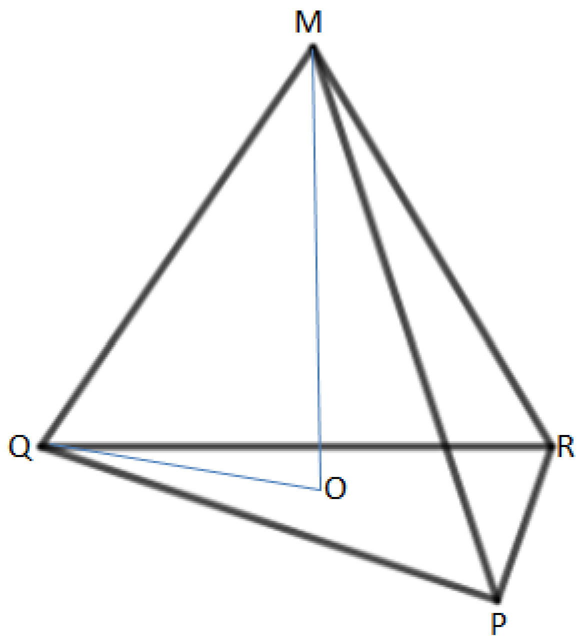
Time=$2\frac{1}{2}$hours

Distance=$\frac{2\pi\theta}{180}$

$= \frac{\frac{22}{7}\times 6370km\times 7}{180} = 778.6km$

From speed=$\frac{778.6}{2\frac{1}{2}} = 311.4\ km/h$

12b.Consider the pyramid below

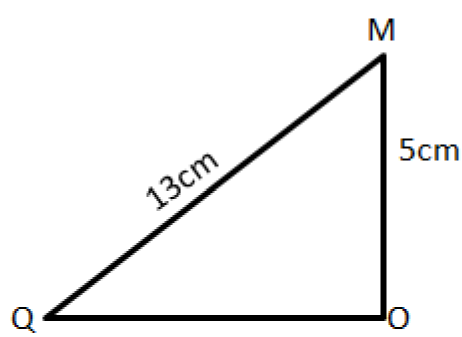


Given

$\overline{MO} = 5cm \ and \ \overline{MQ} = 13cm$

Required to find $\angle MQO$

Consider ΔMQO



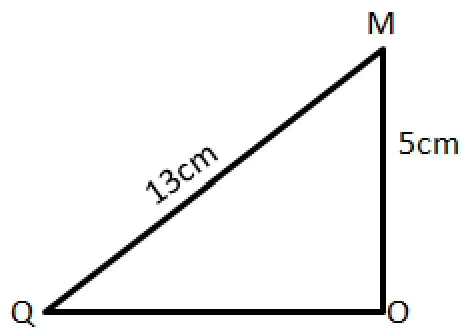
$\sin sin\, Q = \frac{opp}{hyp}$

$= \frac{5cm}{13cm} = 0.3846$

$Q = 0.3846$

$Q = 22.6°$

Again consider ΔMQO



$QO = \sqrt{13^2 - 5^2} = \sqrt{144} = 12cm$

$QO = 12cm$

13a.given the point (6,5) under rotation through 90°

Image under rotation is given by

$$\left(\frac{x'}{y'}\right) = (\cos cos\, \theta \quad - \sin sin\, \theta \quad \sin sin\, \theta \quad \cos cos\, \theta\ )\left(\frac{x}{y}\right)$$

Where by $\left(\frac{x}{y}\right) = \left(\frac{6}{5}\right)$,$\theta = 90°$ then

$$\left(\frac{x'}{y'}\right) = (\cos cos\, 90 \quad - \sin sin\, 90 \quad \sin sin\, 90 \quad \cos cos\, 90\ )\left(\frac{6}{5}\right)$$

$$\left(\frac{x'}{y'}\right) = (0 \quad - 1\ 1\ 0\ )\left(\frac{6}{5}\right)$$

$$\left(\frac{x'}{y'}\right) = (0\times6 \quad - 1\times5\ 1\times6\ 0\times5\ ) = \left(\frac{-5}{6}\right)$$

$$\therefore \left(\frac{x'}{y'}\right) = \left(\frac{-5}{6}\right)$$

The image formed followed by reflection of $180°$

Transformation under reflection is given by

$$\left(\frac{x'}{y'}\right) = (\cos cos\ 2\theta \quad \sin sin\ 2\theta \quad \sin sin\ 2\theta \ \ 2\theta\ )\left(\frac{x}{y}\right)$$

Since it is double transformation then $\left(\frac{x''}{y''}\right) = (\cos cos\ 2\theta \quad \sin sin\ 2\theta \quad \sin sin\ 2\theta \ \ 2\theta\ )\left(\frac{x'}{y'}\right)$

where $\left(\frac{x'}{y'}\right) = \left(\frac{-5}{6}\right)$ and

$\theta\ =\ 180°\ so \left(\frac{x''}{y''}\right) = (\cos cos\ 2\times180° \quad \sin sin\ 2\times180° \quad \sin sin\ 2\times180° \ \ 2\times180°\ )\left(\frac{-5}{6}\right)$

$$\left(\frac{x''}{y''}\right) = (\cos cos\ 360° \quad \sin sin\ 360° \quad \sin sin\ 360° \ \ 360°\ )\left(\frac{-5}{6}\right)$$

$$\left(\frac{x''}{y''}\right) = (1\ 0\ 0\ \ -\ 1\ )\left(\frac{-5}{6}\right) = (1\times\ -\ 5\ 0\times6\ 0\times\ -\ 5\ \ -\ 1\times6\ )$$

$$\left(\frac{x''}{y''}\right) = \left(\frac{-5}{-6}\right)$$

Therefore, the final image will be $(-\ 5, -\ 6)$

13b.given that C is singular matrix $C = (t\ 1\ t\ -\ 25\ 1\ -\ t\ )$

Singular matrix has zero determinants

14.a) f(x)=-x^2 -2x-3

We can find the line of symmetry, maximum or minimum point by puting the equation into perfect square

f(x)=-x^2-2x-3

Factout -ve sign

now the function will be f(x)=-(x^2 +2x+3)

= -((x^2 +2x+1^2)+3-1)

= -($(x+1)^2$+2)

open the blacket by -ve sign

=-$(x+1)^2$ -2

The function contain maximum point because a>0 so the maximum point is -2

ii)To obtain axis of symmetry equate -$(x+1)^2$ =0

Divide -ve throughout then $(x+1)^2$=0

Complete square both side:√$(x+1)^2$=√0

x+1=0 ,x=-1

Therefore the Axis of symmetry=-1

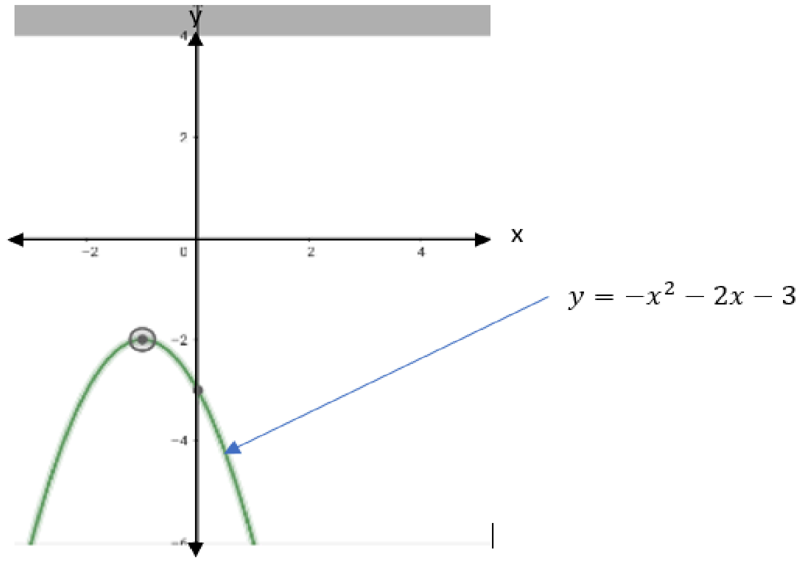
Sketching the graph of f(x)=-x^2-2x-3

Since a>0 The graph will open downward

The turning point P(x,y)=(-1,-2)

y-intercept when x=0 so y=-$(0)^2$ -2(0)-3

y=-3 ,x=0 the graph will not have x intercept because the turning point is at (-1,-2) and it opens downward


y
x
4
2
-2
0
2
4
-2
-4
-6
$y = -x^2 - 2x - 3$

14b.let wheat be x and be y

$2x + y \leq 10$………. i

$700x + 600y \leq 4200$ …….ii

$300x + 400y \leq 2400$……..iii

Profit function=$300x + 400y$