उत्तराखण्ड विद्यालयी शिक्षा परिषद, र

केन्द्र संख्या की मुहर	केन्द्र व्यवस्थापक के हस्ताक्षर
हाईस्कूल के0 सं- 1691	

नोट–केन्द्र के नाम की मुहर उत्तरपुस्तिका के किसी भी भाग पर न लगाएं।

परीक्षार्थी द्वारा भरा जायेगा–

अनुक्रमांक (अंकों में)– 2 2 0 4 6 3 4 2

अनुक्रमांक (शब्दों में)– Two crore twenty lakh, forty six thousand three hundred forty two

विषय– Maths.

प्रश्नपत्र संकेतांक– 231(HOG)

परीक्षा का दिन– Tuesday

परीक्षा तिथि 05 April, 2022

कक्ष निरीक्षक द्वारा भरा जाय–

केन्द्र संख्या– 1 6 9 1

परीक्षा कक्ष संख्या 0 1

उपरोक्त सभी प्रविष्टियों की जाँच मेरे द्वारा सावधानीपूर्वक कर ली गयी है।

कक्ष निरीक्षक का नाम– Meena Nautiyal

दिनांक 05/04/2022

हस्ताक्षर कक्ष निरीक्षक–

प्रमाणित किया जाता है कि मैंने इस उत्तरपुस्तिका का मूल्यांकन सम्बन्धित प्रश्न-पत्र संकेतांक तथा मूल्यांकन निर्देशों के अनुसार किया है। प्राप्तांकों का मुखपृष्ठ पर अग्रसारण कर प्राप्तांकों एवं प्राप्तांकों के योग का मिलान कर लिया गया है। एवार्ड ब्लैंक में प्राप्तांकों की अंकना कर उनका पुनः मिलान भी कर लिया है। किसी भी प्रकार की त्रुटि के लिए मैं उत्तरदायी रहूँगा/रहूँगी।

परीक्षक के हस्ताक्षर एवं संख्या....... H2/0070

1. संवीक्षक के हस्ताक्षर एवं संख्या....... 2310410

2. संवीक्षक के हस्ताक्षर एवं संख्या....... 2310639

सन्निरीक्षा प्रयोगार्थ

सन्निरीक्षा पूर्व अंक–

सन्निरीक्षा पश्चात अंक–

त्रुटि का प्रकार–

दिनांक–

हस्ताक्षर निरीक्षक–

Qus. 1 Ans...

⇒ 21

Qus. 2 Ans...

⇒ 1

Qus. 3 Ans...

⇒ '616 cm^2' will be the surface area of sphere whose diameter is 14 cm

Qus. 4 Ans...

⇒ $\angle B = 90^\circ$

Qus. 5 Ans...

⇒ A die is thrown once, probability of getting an odd no. on the top will be '$\frac{1}{2}$' $\left[\frac{1}{2}\right]$ Answer

Qus. 6 Ans...

⇒ rational number '$\frac{129}{2^2 \times 5^7 \times 7^5}$' will have non-terminating repeated decimal expansion.

Qus. 7 Ans...

⇒ Given, sum of zeroes $= 0$ i.e. $\alpha+\beta$
product of zeroes $= \sqrt{5}$ i.e. $\alpha\beta$

We know, polynomial;

$x^2 - (\alpha+\beta)x + \alpha\beta$

$\Rightarrow x^2 - (0)x + \sqrt{5}$

$\Rightarrow [x^2 + \sqrt{5}]$ is required polynomial

Qus. 8 Ans...

⇒ Given quadratic equation:

$x^2 - 4x + 4$ $\because [ax^2 + bx + c]$ standard form

To find, nature of roots;

Discriminant $= b^2 - 4ac$

$\Rightarrow (-4)^2 - 4(1)(4)$

$\Rightarrow 16 - 16 = 0$

[Sin]ce, in given equation $b^2 - 4ac = 0$, therefore, the quadratic equation $(x^2 - 4x + 4 = 0)$ will have two equal roots.

Qus. 9 Ans...

⇒ A circle can have "infinitely many" tangents.

Qus. 10 Ans...

⇒ Probability of a sure event is "1"

Qus. 11 Ans...

⇒ Let the larger number be 'x' and smaller no. be 'y'
∴[such that $x > y$]
Then, according to question,

$$x - y = 26 \rightarrow (1)$$

Also, given, larger no. is three times the smaller

$$\Rightarrow x = 3y \rightarrow (2)$$

Putting this value in eq(1), we get

$$3y - y = 26$$
$$\Rightarrow 2y = 26$$
$$\Rightarrow [y = 13] \text{ Sol}^n$$

On putting '$y = 13$' in eq^n (2), we obtain

$$[x = 3 \times 13 = 39] \text{ Sol}^n$$

Therefore, the ~~m~~ two numbers are 39 & 13.

Qus 12. Ans...

⇒ Given, $\cos\theta = \frac{4}{5}$

We know, $\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}}$

$\Rightarrow \frac{\text{Base}}{\text{Hypotenuse}} = \frac{4k}{5k}$ i.e. Base = 4k, Hypotenuse = 5k

Such that, 'k' is any +ve integer

Then, according to pythagoras theorem:

$(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

$\Rightarrow (5k)^2 = (4k)^2 + (P)^2$

$\Rightarrow P = \sqrt{25k^2 - 16k^2}$

$P = \sqrt{9k^2} = 3k$

or we can say;

Perpendicular = 3

Now, given, $(\cot\theta + \operatorname{cosec}\theta)^2$

$\because \cot\theta = \frac{\text{Base}}{\text{Perpendicular}} = \frac{4k}{3k}$

$\operatorname{cosec}\theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{5k}{3k}$

$\Rightarrow \left(\frac{4k}{3k} + \frac{5k}{3k}\right)^2 = \left(\frac{9k}{3k}\right)^2 = (3)^2 = \boxed{9}$ Answer

Qus. 13 Ans...

$\Rightarrow$ Given, coordinates : let ~~ABC~~

$A = (3,2)$

$B = (-2,-3)$

$C = (2,3)$ Using distance formula:

i.e. $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

We get,

$AB = \sqrt{(-2-3)^2+(-3-2)^2}$

$\Rightarrow \sqrt{(5)^2+(5)^2} = \sqrt{25+25} = \sqrt{50}$ unit

$BC = \sqrt{(2+2)^2+(3+3)^2}$

$\Rightarrow \sqrt{(4)^2+(6)^2} = \sqrt{16+36} = \sqrt{52}$ unit

$AC = \sqrt{(2-3)^2+(3-2)^2}$

$\Rightarrow \sqrt{(-1)^2+(1)^2} = \sqrt{1+1} = \sqrt{2}$ unit

Here, $AB + BC > AC$

i.e. $\sqrt{50}+\sqrt{52} > \sqrt{2}$

Also, Vice-versa,

Since, sum of any two sides is greater than third side, then coordinates can form a triangle. (Yes)

Triangle ~~is~~ triangle : because

Qus 14 · Ans ....

⇒ In provided figure, ΔABC has $DE \parallel AC$.

Then, by using Basic Proportionality Theorem :

$$\frac{AD}{BD} = \frac{CE}{BE}$$

$$\Rightarrow \frac{3}{3} = \frac{4}{x} \Rightarrow 3x = 12$$

$$\Rightarrow x = \frac{12}{3} = \boxed{4} \text{ Ans}$$

Therefore, we obtain, $x = 4$

Qus. 15 Ans...

(a) ⇒ To find probability of drawing an ace card from well shuffled deck of 52 cards; $P(E)$

We know,

total possible outcome = 52; as there are total 52 card,

Also, there are total 4 set in a deck, each set has one ace

i.e. ⇒ $P(E) = \dfrac{\text{total favourable outcome}}{\text{total possible outcome}}$

⇒ $P(E) = \dfrac{4}{} = \left[\dfrac{1}{}\right]$ Ans

(b) ⇒ a red card.

~~Then~~ Out of 4 ~~deck~~ set in a deck, 2 sets are of red cards each consist of 13 cards

i.e. total red cards in a deck $= 2 \times 13$
$= 26$

Therefore, $P(E) = \frac{26}{52} = \boxed{\frac{1}{2}}$ Ans.

Qus. 16 Ans...

⇒ We need to prove $\sqrt{7}$ is irrational

let us assume $\sqrt{7}$ is rational
[By proof of contradiction ;]

Then, $\sqrt{7}$ can be written in the form p/q ⇒ $\sqrt{7} = \frac{p}{q}$

[If ~~we~~ p & q have common factor other than 1, then we can divide p & q by that no.]

Thus we have p & q as co-prime

i.e. ⇒ $\sqrt{7} = \frac{p}{q}$ $(\neq 0)$

$q\sqrt{7} = p$

$$7q^2 = p^2 \rightarrow ①$$

$\Rightarrow$ This shows that p^2 is divisible by 7, and if p^2 is divisible than 'p' will also be divisible by 7 (by theorem)

Now, let, $p = \cancel{7q}\ 7a$

Then, eqn 1 become,

$$7q^2 = (7a)^2$$

$$\Rightarrow 7q^2 = 49a^2$$

$$\Rightarrow q^2 = 7a^2 \rightarrow ②$$

This shows that q^2 is divisible by 7, and same q also.

From above, eqns we obtain,

"7" as common factor of p & q
But this contradicts to fact that they're co-prime.

This contradiction has arisen due to our false assumption!

Hence, our assumption is false, thus, we can conclude that $\sqrt{7}$ is irrational.

Qus. 17 Ans...

$\Rightarrow$ Given, quadratic equation ; (has equal roots)

$(a-12)x^2 + 2(a-12)x + 2 = 0$

To find value of 'a'

Since, equation has two equal roots $\Rightarrow$

$b^2 - 4ac = 0$

Here, $b = 2(a-12) = 2a-24$

$a = a-12$

$c = 2$

Thus, we can write,

$(2a-24)^2 - 4(a-12)(2) = 0$

i.e. $(4a^2 + 576 - 96a) - 8a + 96 = 0$

$\Rightarrow$ $4a^2 + 672 - 104a$ or $4a^2 - 104a + 672$

Dividing eqn by '4'

$\Rightarrow$ $a^2 - 26a + 168 = 0$

$\Rightarrow$ $a^2 - 12a - 14a + 168 = 0$

$\Rightarrow$ $a(a-12) - 14(a-12) = 0$

$\Rightarrow$ $(a-12)(a-14) = 0$

for, $a-12 = 0$; $a = 12$

for, $a-14 = 0$; $a = 14$ Ans

The req. value of 'a' can be either 12 or 14

[Qus. 18 Ans...]

⇒ Given, equations :

$\frac{1}{x} + \frac{2}{y} = 3 \rightarrow$ (1) eqⁿ

$\frac{2}{x} - \frac{4}{y} = 2 \rightarrow$ (2) eqⁿ

let, $\frac{1}{x} = A$ & $\frac{1}{y} = B$

Then, eqⁿ 1 becomes, ⇒ $A + 2B = 3 \rightarrow$ (3) eqⁿ
& eqⁿ 2 " ⇒ $2A - 4B = 2 \rightarrow$ (4) eqⁿ

Multiplying 2 with eqⁿ (3)

⇒ $2A + 4B = 6 \rightarrow$ (5) eqⁿ

On solving eqⁿ 4 & 5 (elimination metho
we obtain $\left[B = \frac{1}{2}\right]$

On putting this value in eqⁿ 3,

we get, $A + 1 = 3$
⇒ $A = 2$

Hence, we have $A = \cancel{A}\,2$ & $B = 1/2$

Now, we have : $A = \frac{1}{x} = 2 \Rightarrow x = \left[\frac{1}{2}\right]$ Ans

similarly : $B = \frac{1}{y} = \frac{1}{2} \Rightarrow y = [2]$ Ans

Qus. 19 Ans..-

⇒ Given, first term of an A.P. = 5
last term same A.P. = 45

⇒ $a = 5$, $(a_n)\ l = 45$

Also, given, sum of terms, $S_n = 400$

$$\Rightarrow S_n = \frac{n}{2}[a + l]$$

$$\Rightarrow 400 = \frac{n}{2}[5 + 45]$$

$$\Rightarrow \frac{50n}{2} = 400 \quad \Rightarrow n = \frac{400 \times 2}{50}$$

$$n = \frac{800}{50} = \boxed{16} \text{ Ans}$$

To find common difference,

$$a_{16} = a + (16-1)d$$

$$\Rightarrow 45 = 5 + 15d$$

$$\Rightarrow \frac{40}{15} = d \quad \Rightarrow d = \left[\frac{8}{3}\right] \text{ Ans}$$

Therefore, we obtain, total number of terms in A.P. = 16
and ~~la~~ common difference of A.P = $\left[\frac{8}{3}\right]$

[Qus. 20 Ans...]

⇒ To prove: $\frac{1 + \sec A}{\sec A} = \frac{\sin^2 A}{1 - \cos A}$

Taking L.H.S

$\Rightarrow$ $\frac{1+\sec A}{\sec A} = \frac{1}{\sec A} + \frac{\sec A}{\sec A}$

$\Rightarrow$ $\cos A + 1$ or $[1+\cos A]$ LHS

Taking R.H.S

$\Rightarrow$ $\frac{\sin^2 A}{1-\cos A}$ $[\because \sin^2 A = 1-\cos^2 A]$

$\Rightarrow$ $\frac{1-\cos^2 A}{1-\cos A}$ $[\because (1)^2 - \cos^2 A = (1+\cos A)(1-\cos A)]$

$\Rightarrow$ $\frac{(1+\cos A)(1-\cos A)}{1-\cos A} = [1+\cos A]$ R.H.S

We get, $1+\cos A = 1+\cos A$

$\Rightarrow$ L.H.S = R.H.S

Hence proved!

Ques. 21 Ans...

$\Rightarrow$ Given coordinates A(-1, 7) & B(4, -3) forming a line segment,

Let line segment = AB

& Let (x, y) be the coordinate which

divides AB in the ratio 2:3

Thus, $m_1 : m_2 \Rightarrow 2:3$

Then, by using section formula, for (x, y)

$$x = \left[\frac{m_1(x_2) + m_2(x_1)}{m_1 + m_2}\right]$$

$$y = \left[\frac{m_1(y_2) + m_2(y_1)}{m_1 + m_2}\right]$$

$$\Rightarrow x = \left[\frac{2(4) + 3(-1)}{2+3}\right] \Rightarrow \frac{8-3}{5} = \frac{5}{5} = \boxed{1}$$

$$\Rightarrow y = \left[\frac{2(-3) + 3(7)}{2+3}\right] \Rightarrow \frac{-6+21}{5} = \frac{15}{5} = \boxed{3}$$

Hence, required coordinate $(x, y) = (1, 3)$

Solution

[Qus. 22 Ans...]

$\Rightarrow$ Given, a point on x-axis which is equidistant from $(2, -5)$ & $(-2, 9)$

Let, that point be '$P(x, y)$' $\Rightarrow$ since it lies on x-axis $\Rightarrow (x, 0)$ i.e $P = (x, 0)$

Let, $A = (2, -5)$ & $B = (-2, 9)$

According to question,

$$AP = BP \rightarrow (1)$$

Using distance formula : $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$.

eq(1) $\Rightarrow$ $\sqrt{(2-x)^2+(-5-0)^2} = \sqrt{(-2-x)^2+(9-0)^2}$

On squaring both sides

$\Rightarrow$ $(2-x)^2+(-5)^2 = (-2-x)^2+(9)^2$

$\Rightarrow$ $4+x^2-4x+25 = 4+x^2+4x+81$

$\Rightarrow$ $-4x-4x = 81-25$

$-8x = 56$

$x = \frac{56}{-8} = [-7]$

Therefore required coordinate $(x,0) = [(-7,0)]$ Ans

$(-7,0)$

[Qus. 23 Ans...]

$\Rightarrow$ In the provided figure,

side of square ABCD = 14 cm

Then, its area = side $\times$ side

$= 14 \times 14$

Area of square = $[196\ cm^2]$

Area of semicircle $= \frac{1}{2} \times \pi \times (r)^2$

In the given semicircle, radius = half of side of square $= \frac{14}{2} = 7cm$

Therefore area of semi-circle $= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$

$\Rightarrow$ $77\ cm^2$

Then, area of 2 semi circle $= 2 \times 77\ cm^2$
$= [154\ cm^2]$

It is clear from fig. that :

Area of shaded region = (Area of square)
— (area of 2 x semi circles)

$\Rightarrow$ Area of shaded region $= 196 - 154$
$\Rightarrow$ $42\ cm^2$ Solution

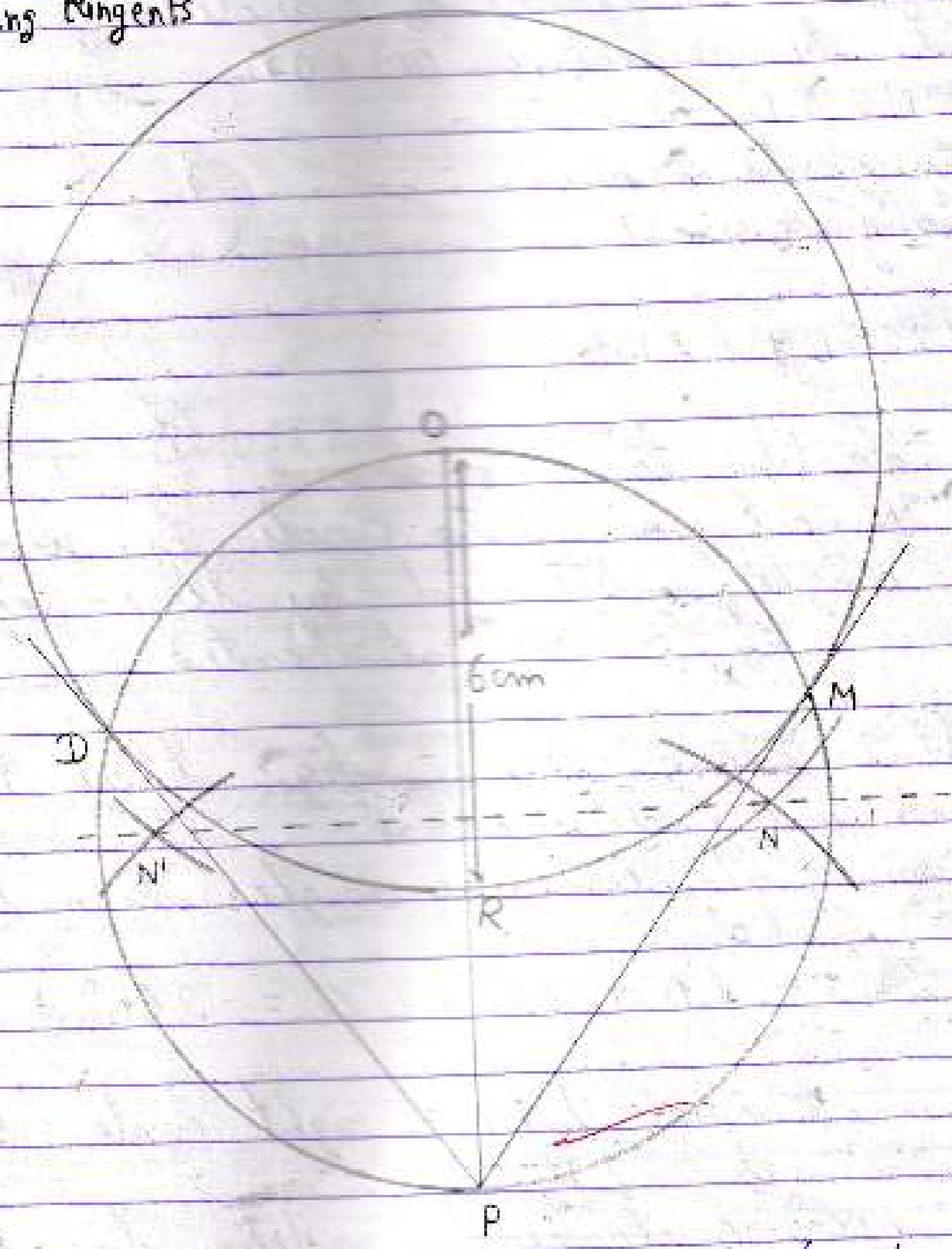
Hence, area of shaded region $= 42\ cm^2$

Roll No
अनुक्रमांक

05/04/2022

Qus. 24 Ans...

⇒ Forming tangents



In provided fig., by construction
we have, radius OR = 6 cm
line seg.. OP = 10 cm

Therefore, we recieve
tangents PD & PM
such that ; PD = 8 cm
PM = 8 cm

Qus. 25 Ans...

⇒ Let O be centre of a circle its be respective OM & OD & MN & DN are two tangents drawn to given circle

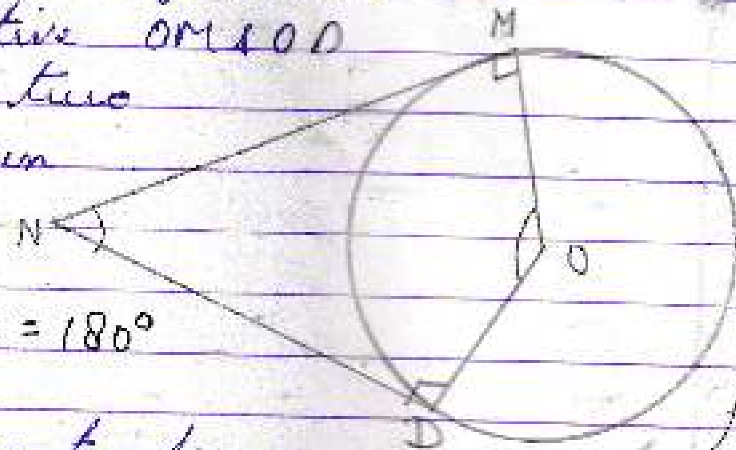


fig...

To prove: $\angle MND + \angle MOD = 180°$

i.e. angle b/w tangents from external point to circle is supplementary to angle subtended by line-seg. joining point of contact at centre.

Proof: It is clear from fig. that MODN is a quadrilateral.
Sum of all interior angles in a quadrilat = 360°

$\angle M + \angle O + \angle N + \angle D = 360° \rightarrow (1)$

Also, we know, $\angle M$ = right angle = 90°
& $\angle D$ = " " = 90°
[∵ because ~~tangents~~ radius drawn to point of contact ~~for~~ are perpendicular to tangents i.e. forms 90°]

Putting these values in eqⁿ (1), we obtain :

$\Rightarrow \quad 90^\circ + \angle O + \angle N + 90^\circ = 360^\circ$

$\Rightarrow \quad \angle O + \angle N = 360^\circ - 90 - 90$

$\Rightarrow \quad \angle O + \angle N = 180^\circ$

Hence, proved that $\angle MND$ and $\angle MOD$ are supplementary!

Qus. 26 Ans...

$\Rightarrow$ Let the speed of stream be 'x km/hr'

Given, $\Rightarrow$ speed of boat 18 km/hr

& distance = 24 km

Case I: When ~~speed~~ boat goes upstream then its speed $\Rightarrow$ $(18-x)$ km/h

Also, Time = $\dfrac{\text{Distance}}{\text{Speed}}$ [Let time taken be T_1]

$T_1 = \dfrac{24}{18-x}$

Case II: When boat goes downstream its speed $\Rightarrow$ $(18+x)$ km/hr

Let, time taken be T_2

$\Rightarrow \quad T_2 = \dfrac{24}{18+x}$

According to question,

motor boat taken 1 hour more when it goes upstream than downstream,

This implies that:

$$\Rightarrow \frac{24}{(18-x)} - \frac{24}{(18+x)} = 1 \quad \text{ie} \quad T_1 - T_2 = 1$$

$$\Rightarrow \frac{24(18+x) - 24(18-x)}{(18-x)(18+x)} = 1 \qquad [\because (a-b)(a+b) = a^2$$

$$\Rightarrow \frac{432 + 24x - 432 + 24x}{(18)^2 - (x)^2} = 1$$

To,

$$\Rightarrow 48x = 324 - x^2$$

$$x^2 + 48x - 324 = 0 \quad [ax^2 + bx + c] \text{ standard form}$$

Using quadratic formula

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

$$\frac{-48 \pm \sqrt{(48)^2 - 4(1)(324)}}{2(1)}$$

$$\Rightarrow \frac{-48 \pm \sqrt{3600}}{2}$$

$$\Rightarrow \frac{-48 \pm 60}{2}$$

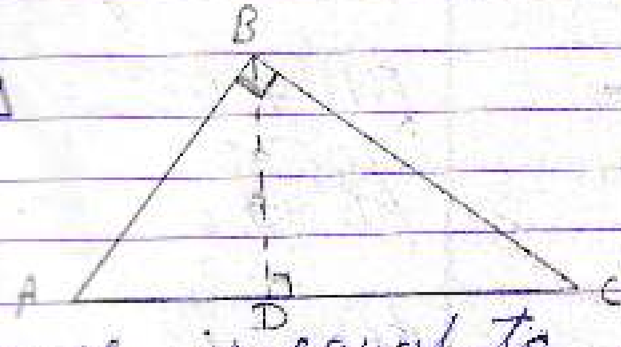
for (+ve) $\frac{-48+60}{2} = \frac{12}{2} = \boxed{6}$ Ans

for (-ve) $\frac{-48-60}{2} = -\frac{108}{2} = \boxed{-54}$

Since, speed is a measure, which can't be negative

Therefore, speed of stream, $x = [\,6 \text{ km/hr}\,]$

Qus 28. Ans...



⇒ Let, ABC be a right Δ right angled at B

To prove: $AC^2 = AB^2 + BC^2$

i.e. square of hypotenuse is equal to sum of squares of other 2 sides.

Construction: Draw $BD \perp AC$

Proof: We know, Theorem, that

[∵ If a perpendicular is drawn from vertex of right angle in a right triangle to hypotenuse, then triangles formed on each side are similar to whole and to each other]

⇒ $\Delta ABD \sim \Delta ACB$

Then, according to Thales theorem

$$\frac{AD}{AB} = \frac{AB}{AC}$$

$$\Rightarrow AC \cdot AD = AB^2 \longrightarrow ①$$

Also, $\Delta BDC \sim \Delta ABC$ [from above used theorem]

Then, by Thales theorem:

$$\frac{CD}{BC} = \frac{BC}{AC}$$

$$\Rightarrow CD \cdot AC = BC^2 \longrightarrow ②$$

On adding eq^n (1) & (2), we obtain

$AB^2 + BC^2 = AC \cdot AD + AC \cdot CD$

$\Rightarrow AB^2 + BC^2 = AC(AD + CD)$

from fig, we have $AD + CD = AC$

Therefore, $AB^2 + BC^2 = AC(AC)$

To $AB^2 + BC^2 = AC^2$

Hence, proved ! i.e. $AC^2 = AB^2 + BC^2$

i.e. In a right $\triangle$, sq. of hypotenuse = Sum of sq.s of other 2 sides

Qus. 29 Ans....

$\Rightarrow$ Given, a pipe of diameter $= 20\,cm$
$= 0.2\,m$

Then, area of its cross - section
$= \pi r^2 = \pi\left(\frac{0.2}{2}\right)^2$

Also, given, a rate of flow of water $= 3\,km/hr$

or $\Rightarrow \frac{3000\,m}{60\,min} = 50\,m/min$

Thus, we can conclude that total wa[ter] ~~area~~ drawn from pipe in a min

$\Rightarrow$ area of cross section $\times$ speed

$\Rightarrow \pi(0.1)^2 \times 50 \quad \Rightarrow \pi \times 0.01 \times 50$

$\Rightarrow$ ~~0.5~~ $0.5\pi\ cm^2$

To find time in which tank will be filled;

let, time taken be 'T'

Given, cylindrical tank : diameter $= 10cm$

ht. (depth) $= 2cm$

Then, total water in it $=$ its volume

$\Rightarrow \pi r^2 h = \pi\left(\frac{10}{2}\right)^2 \times 2 = \pi(5)^2 \times 2$

Arithmetically, time (T) in which tank will be filled with water by pipe

$\Rightarrow T \cdot 0.5\pi = \pi(5)^2 \times 2$

$T = \frac{\pi(5)^2 \times 2}{0.5\pi} = \frac{5^2 \times 2}{0.5} = \frac{50}{0.5} = \boxed{100}$ Min

Thus, in 100 minutes tank will be filled by water. (using pipe)!!

Qus. 30 Ans...

C. I. (Marks)	0-10	10-20	20-30	30-40	40-50	50-60
No. of students	6	14	10	15	5	10

To find mode :

It is clear from given data that, highest frequency i.e 15 belong to class interval 30-40.
Hence, C.I.: 30-40 ⇒ ~~cla~~ Modal Class

Now,
Lower limit of modal class, $l = 30$

Frequency of ~~modal~~ class, $f_1 = 15$

Frequency of class preceding modal class, $f_0 = 10$

Frequency of class succeding modal class, $f_2 = 5$

difference b/w upper & lower limit of modal class, i.e $40 - 30$, $h = 10$

Now, we know:
$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

Substituting required values in provided formula we obtain ;

$$\Rightarrow 30 + \left[\frac{15-10}{2(15)-10-5}\right] \times 10$$

$$\Rightarrow 30 + \left[\frac{5}{30-10-5}\right] \times 10$$

$$\Rightarrow 30 + \frac{5}{15} \times 10$$

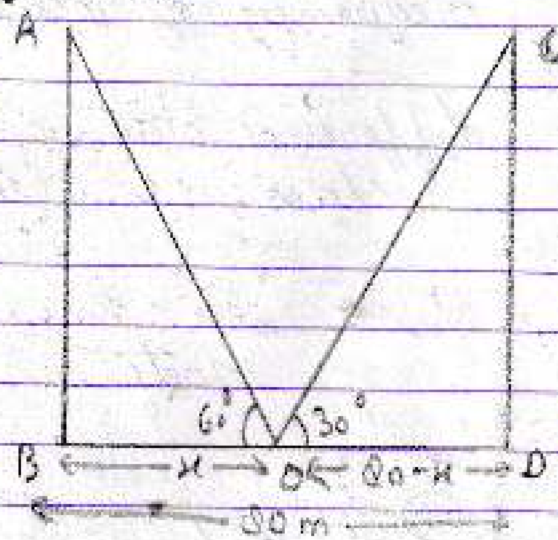
$$\Rightarrow 30 + \frac{1 \times 10}{3} \Rightarrow 30 + \frac{10}{3}$$

$$\Rightarrow 30 + 3.33$$

$$\Rightarrow \boxed{33.33} \text{ Ans}$$

Hence, modes of marks obtained = $\boxed{33.33}$

Qus. 27 Ans...



⇒ Given two poles of equal ht.
let AB = CD
Distance b/w two poles = 80m
& O is point at BD

Let, BO = x metre
DO = $80-x$ metre.

Also given, respective angle of elevation b/w them.

Now, from fig

In ΔABO, $\tan 60^\circ = \frac{AB}{BO}$

$\Rightarrow \sqrt{3} = \frac{AB}{x} \Rightarrow x = \frac{AB}{\sqrt{3}}$ or $BO = \frac{AB}{\sqrt{3}}$ $\rightarrow$ (1)

In ΔCOD, $\tan 30^\circ = \frac{CD}{DO}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{CD}{80-x} \Rightarrow 80-x = CD\sqrt{3}$
or $DO = CD\sqrt{3} \rightarrow$ (2)

We know, $BO + DO = 80$

$\Rightarrow$ from eq (1) & (2) we substitute value of BO & DO

$\Rightarrow \frac{AB}{\sqrt{3}} + CD\sqrt{3} = 80$

$\Rightarrow \frac{AB + CD\sqrt{3}(\sqrt{3}}{\sqrt{3}} = 80$

$\Rightarrow AB + 3CD = 80\sqrt{3}$

$\Rightarrow 4AB = 80\sqrt{3}$ [$\because AB = CD$ given]

$AB = \frac{80\sqrt{3}}{4} = 20\sqrt{3}$

Hence ht. of ~~two~~ each pole $= 20\sqrt{3}$ m

Now, we know, $x = \frac{AB}{\sqrt{3}} = \frac{20\sqrt{3}}{\sqrt{3}} = 20$

We get, $x = 20$ m $= BO$

Also, $DO = 80 - x$

$DO = 80 - 20 = \underline{60\ m}$

Hence, height of each pole $= 20\sqrt{3}$ m

distance of BO $= 20$ m

" " DO $= 60$ m

Answer