X Revision Worksheet (Homework - 13) BOARD EXAM QUESTIONS

PART - A (Section - 1) - 1 mark each

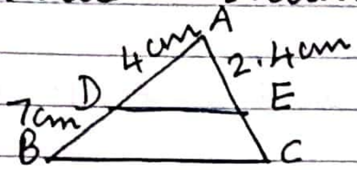
1) If one of the zeroes of the quadratic polynomial x^2+3x+k is 2, then find the value of k.

2) Find the total number of factors of a prime number.

3) Find the HCF and LCM of 12, 21, 15.

4) Find the value of k for which the system of equations $x+y-4=0$ and $2x+ky=3$ has no solution.

5) Find the value of x for which $2x$, $(x+10)$ and $(3x+2)$ are the three consecutive terms of an A.P.

6) 

DE || BC, then find EC.

7) Find the value of $\left(\sin^2\theta + \frac{1}{1+\tan^2\theta}\right)$

8) Find the value of $(1+\tan^2\theta)(1-\sin\theta)(1+\sin\theta)$

9) If ABC is an equilateral Δ of side 2a, then find the length of one of its altitudes.

10) 

MN || QR. If PM = x cm, MQ = 10 cm, PN = $(x-2)$ cm, NR = 6 cm, find the value of x.

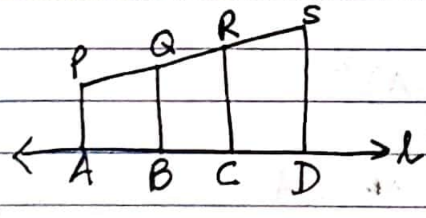
11) Base of an isosceles Δ is $\frac{2}{3}$ times its congruent sides. Perimeter of the triangle is 32 cm. Formulate this problem as a pair of linear equations in two variables.

12) Check whether $x(x+2)-3=(x+4)x$ is a quadratic equation.

13) Is $x=-2$ a solution of $3x^2+13x+14=0$?

14) State whether the equation $(x+1)(x-2)+x=0$ has two distinct real roots or not. Justify your answer.

15) Write a rational number between $\sqrt{2}$ and $\sqrt{3}$.

16) 

PA, QB, RC and SD are all perpendiculars to a line l, AB = 6 cm, BC = 9 cm, CD = 12 cm and SP = 36 cm. Find PQ, QR and RS.

17) Prove that the sum of squares of the sides of a rhombus is equal to the sum of the squares of its diagonals.

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18) If the roots of the equation $(a-b)x^2+(b-c)x+(c-a)=0$ are equal, Prove that $2a=b+c$.

19) The sum of the squares of two consecutive odd numbers is 394. Find the numbers.

20) If $\sin\theta+\cos\theta=\sqrt{3}$, then prove that $\tan\theta+\cot\theta=1$

21) Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x)=ax^2+bx+c$; $a\neq0$; $c\neq0$.

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X Homework-13 (Answers - board exam questions)

1) Let $p(x) = x^2 + 3x + k$.
When 2 is a zero of $p(x)$, then $p(2) = 0$

$\Rightarrow (2)^2 + 3\times 2 + k = 0$

$\Rightarrow 4 + 6 + k = 0$

$\therefore k = -10$

2) A prime number has only two factors.
ie, 1 and the number itself.
eg:- 2, 3, 5 etc

3) $12 = 2^2 \times 3$
$21 = 7 \times 3$
$15 = 5 \times 3$

HCF(12, 21, 15) = 3

$LCM(12, 21, 15) = 2^2 \times 7 \times 5 \times 3$
$= 4 \times 7 \times 5 \times 3$
$= 28 \times 15$
$= 420$

$$\begin{array}{r} 28 \\ \times 15 \\ \hline 140 \\ 28 \\ \hline 420 \end{array}$$

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4) Let the given equation be of the form
$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$; where
$a_1 = 1, b_1 = 1, c_1 = -4$
$a_2 = 2, b_2 = k, c_2 = -3$

For no solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\Rightarrow \frac{1}{2} = \frac{1}{k} \neq \frac{-4}{-3}$

$\therefore \frac{1}{2} = \frac{1}{k}$

$\Rightarrow k = 2$

$\frac{1}{k} \neq \frac{4}{3}$

$\Rightarrow k \neq \frac{3}{4}$.

5) Since the given terms are in A.P, the difference between two consecutive terms will be the same.

Then, $x + 10 - 2x = 3x + 2 - x - 10$

$\Rightarrow 10 - x = 2x - 8$

$\Rightarrow -x - 2x = -8 - 10$

$\Rightarrow \cancel{-}3x = \cancel{-}18$

$\therefore x = \frac{18}{3} = 6$

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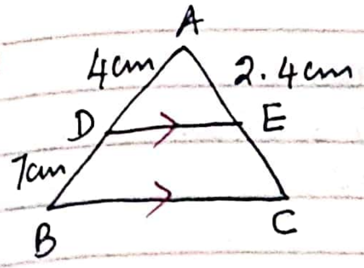
6) 

Since DE || BC, using Basic Proportionality Theorem, $\frac{AD}{BD} = \frac{AE}{CE}$

$\Rightarrow \frac{4}{7} = \frac{2.4}{EC}$

$\Rightarrow EC = \frac{\overset{0.6}{\cancel{2.4}} \times 7}{\underset{1}{\cancel{4}}} = 0.6 \times 7 = \underline{4.2\text{cm}}$

7) $\sin^2\theta + \frac{1}{1+\tan^2\theta} = \sin^2\theta + \frac{1}{\sec^2\theta}$ $[\because \sec^2\theta = 1+\tan^2\theta]$

$= \sin^2\theta + \cos^2\theta$ $\left[\because \cos\theta = \frac{1}{\sec\theta}\right]$

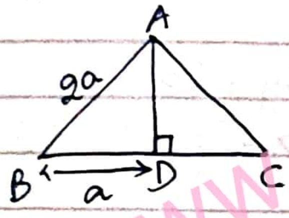
$= \underline{\underline{1}}$ $[\because \sin^2\theta + \cos^2\theta = 1]$

8) $(1+\tan^2\theta)(1-\sin\theta)(1+\sin\theta)$

$= (1+\tan^2\theta)(1-\sin^2\theta)$ $[\because (a+b)(a-b) = a^2 - b^2]$

$= \sec^2\theta \times \cos^2\theta$ $[\because \cos^2\theta = 1 - \sin^2\theta]$

$= \underline{\underline{1}}$ $[\because \cos\theta \cdot \sec\theta = 1]$

9) 

Construction: draw $AD \perp BC$

In $\triangle ADB$ and $\triangle ADC$, $\angle ADB = \angle ADC$ (each $90°$)

$AB = AC$ (each 2a units)

$AD = AD$ (Common side)

$\therefore \triangle ADB \cong \triangle ADC$ (RHS Congruency)

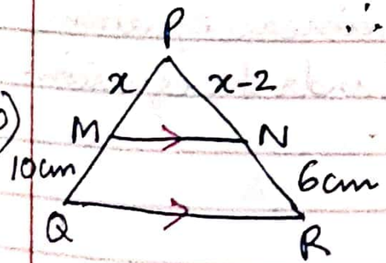
Thus, $BD = DC = \frac{1}{2} BC = \frac{1}{2} \times 2a = \underline{\underline{a}}$ units

Using Pythagoras Theorem in rt. $\triangle ADB$,

$AD^2 = AB^2 - BD^2$

$= (2a)^2 - a^2 = 4a^2 - a^2 = 3a^2$

$\therefore \underline{\underline{AD = \sqrt{3}a \text{ units}}}$

10) 

Since MN || QR, using Basic Proportionality Theorem, $\frac{PM}{MQ} = \frac{PN}{NR}$

$\Rightarrow \frac{x}{10} = \frac{x-2}{6}$

$\Rightarrow 6x = 10(x-2)$

$\Rightarrow 6x = 10x - 20$

$6x - 10x = -20$

$\cancel{-}4x = \cancel{-}20$

$\therefore x = \frac{20}{4}$

$= \underline{\underline{5\text{cm}}}$

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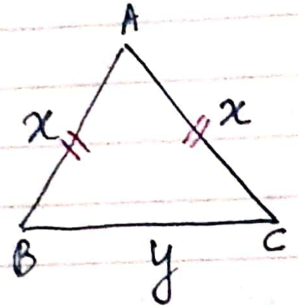
11) 

Let $AB = AC = x$ cm
and $BC = y$ cm

Then, $y = \frac{2}{3}x \Rightarrow 3y = 2x$
$\Rightarrow 2x - 3y = 0 \rightarrow (1)$

Also, Perimeter $(\triangle ABC) = x + y + x = 32$
$2x + y = 32 \longrightarrow (2)$

Thus eq: (1) and (2) represent the required linear equations in two variables of the form $ax + by + c = 0$

12) $x(x+2) - 3 = (x+4)x$
$\Rightarrow \cancel{x^2} + 2x - 3 = \cancel{x^2} + 4x$
$\Rightarrow 2x - 4x = 3$
$\Rightarrow -2x = 3$
$\therefore 2x + 3 = 0$, which is a linear equation but not a quadratic equation.

13) when $x = -2$, $3(-2)^2 + 13(-2) + 14$
$= 3 \times 4 - 13 \times 2 + 14$
$= 12 - 26 + 14$
$= 26 - 26 = 0$

Thus $x = -2$ is a solution of the given equation.

14) $(x+1)(x-2) + x = 0$
$\Rightarrow x^2 - 2x + x - 2 + x = 0$

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$\Rightarrow x^2 - \cancel{2x} + \cancel{2x} - 2 = 0$

$\Rightarrow x^2 - 2 = 0$, which is of the form $ax^2 + bx + c = 0$; where $a = 1$, $b = 0$, $c = -2$.

Then, $b^2 - 4ac = 0^2 - 4 \times 1 \times -2 = 8 > 0$

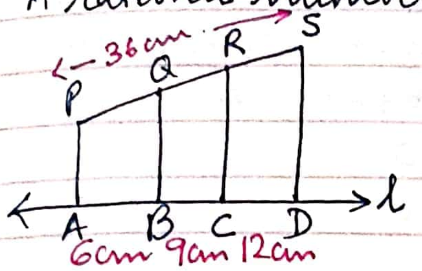
Hence the given equation has two distinct real roots.

15) $\sqrt{2} = 1.414\ldots$

$\sqrt{3} = 1.732\ldots$

A rational number between $\sqrt{2}$ and $\sqrt{3}$ is $\underline{\underline{1.5}}$

16)



Since PA, QB, RC and SD are perpendicular to line l,

$PA \parallel QB \parallel RC \parallel SD$.

Thus, $\dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{CD}{RS} = \dfrac{AD}{PS}$

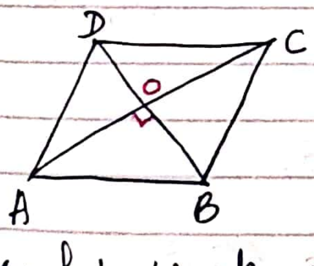
$$\Rightarrow \frac{6}{PQ} = \frac{9}{QR} = \frac{12}{RS} = \frac{27}{36}$$

$\therefore \dfrac{6}{PQ} = \dfrac{27}{36} \Rightarrow PQ = \dfrac{\cancel{6}^{2} \times \cancel{36}\,4}{\cancel{27}\,\cancel{3}\,1} = 8\text{cm}$ //

$\dfrac{9}{QR} = \dfrac{27}{36} \Rightarrow QR = \dfrac{\cancel{9}^{3} \times \cancel{36}\,4}{\cancel{27}\,\cancel{3}\,1} = 12\text{cm}$ //

$\dfrac{12}{RS} = \dfrac{27}{36} \Rightarrow RS = \dfrac{\cancel{12}^{4} \times \cancel{36}\,4}{\cancel{27}\,\cancel{3}\,1} = 16\text{cm}$ //

17)



Given: in rhombus ABCD, AC and BD are the diagonals.

To prove : $AB^2 + BC^2 + CD^2 + AD^2 = AC^2 + BD^2$

Proof :- We know that diagonals of a rhombus bisect each other at $90°$,

In rt. $\triangle AOB$, using Pythagoras theorem,

$$AB^2 = OA^2 + OB^2$$
$$= \left(\frac{1}{2}AC\right)^2 + \left(\frac{1}{2}BD\right)^2$$
$$= \frac{AC^2}{4} + \frac{BD^2}{4}$$

$\therefore 4AB^2 = AC^2 + BD^2$

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We know that all sides are equal in a rhombus.
Thus $AB^2 + BC^2 + CD^2 + AD^2 = AC^2 + BD^2$ [$\because AB = BC = CD = AD$]
Hence Proved.

18) Let the given eq: be of the form $Ax^2 + Bx + C = 0$;
where $A = (a-b)$; $B = (b-c)$; $C = (c-a)$
For equal roots, $B^2 - 4AC = 0$

$$\Rightarrow (b-c)^2 - 4(a-b)(c-a) = 0$$
$$\Rightarrow b^2 + c^2 - 2bc - 4(ac - a^2 - bc + ab) = 0$$
$$\Rightarrow b^2 + c^2 - 2bc - 4ac + 4a^2 + 4bc - 4ab = 0$$
$$\Rightarrow 4a^2 + b^2 + c^2 - 4ab + 2bc - 4ac = 0$$
$$\Rightarrow (-2a + b + c)^2 = 0$$
$$\Rightarrow -2a + b + c = 0$$
$$\therefore \underline{\underline{2a = b + c}}$$

19) Let the two consecutive odd numbers be x and $x+2$.

$5 \,|\, 195$
$3 \,|\, 39$
13

Then, $x^2 + (x+2)^2 = 394$
$$\Rightarrow x^2 + x^2 + 4x + 4 = 394$$
$$\Rightarrow 2x^2 + 4x - 390 = 0$$
$$\Rightarrow x^2 + 2x - 195 = 0$$
$$\Rightarrow (x+15)(x-13) = 0$$
$$\therefore x = -15, 13$$

S P
2 −195
15, −13

Since x is an odd number, the required value of $x = 13$.
Hence the numbers are 13 and 15.

20) $\sin\theta + \cos\theta = \sqrt{3}$
Squaring on both sides, $(\sin\theta + \cos\theta)^2 = (\sqrt{3})^2$
$$\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$$
$$\Rightarrow 1 + 2\sin\theta\cos\theta = 3 \quad [\because \sin^2\theta + \cos^2\theta = 1]$$
$$\Rightarrow 2\sin\theta\cos\theta = 3 - 1 = 2$$
$$\therefore \sin\theta\cos\theta = \frac{2}{2} = \underline{\underline{1}} \longrightarrow (1)$$

Thus, $\tan\theta + \cot\theta = \dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta} = \dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta}$
$$= \frac{1}{1} = \underline{\underline{1}}, \text{RHS} \quad [\text{from eq: } (1)]$$

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21) Let the zeroes of the polynomial $f(x) = ax^2+bx+c$ be α and β.

Then, $\alpha+\beta = -\frac{b}{a}$

and $\alpha\beta = \frac{c}{a}$

For new polynomial, the zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

Then, sum of zeroes $= \frac{1}{\alpha}+\frac{1}{\beta} = \frac{\beta+\alpha}{\alpha\beta} = \frac{-\frac{b}{\cancel{a}}}{\frac{c}{\cancel{a}}} = -\frac{b}{c}$

product of zeroes $= \frac{1}{\alpha}\times\frac{1}{\beta} = \frac{1}{\alpha\beta} = \frac{1}{c/a} = \frac{a}{c}$

Hence the required quadratic polynomial

$= x^2-(\text{sum of zeroes})x + \text{product of zeroes}$

$= x^2-\left(-\frac{b}{c}\right)x + \frac{a}{c}$

$= x^2+\frac{b}{c}x+\frac{a}{c}$ or cx^2+bx+a

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