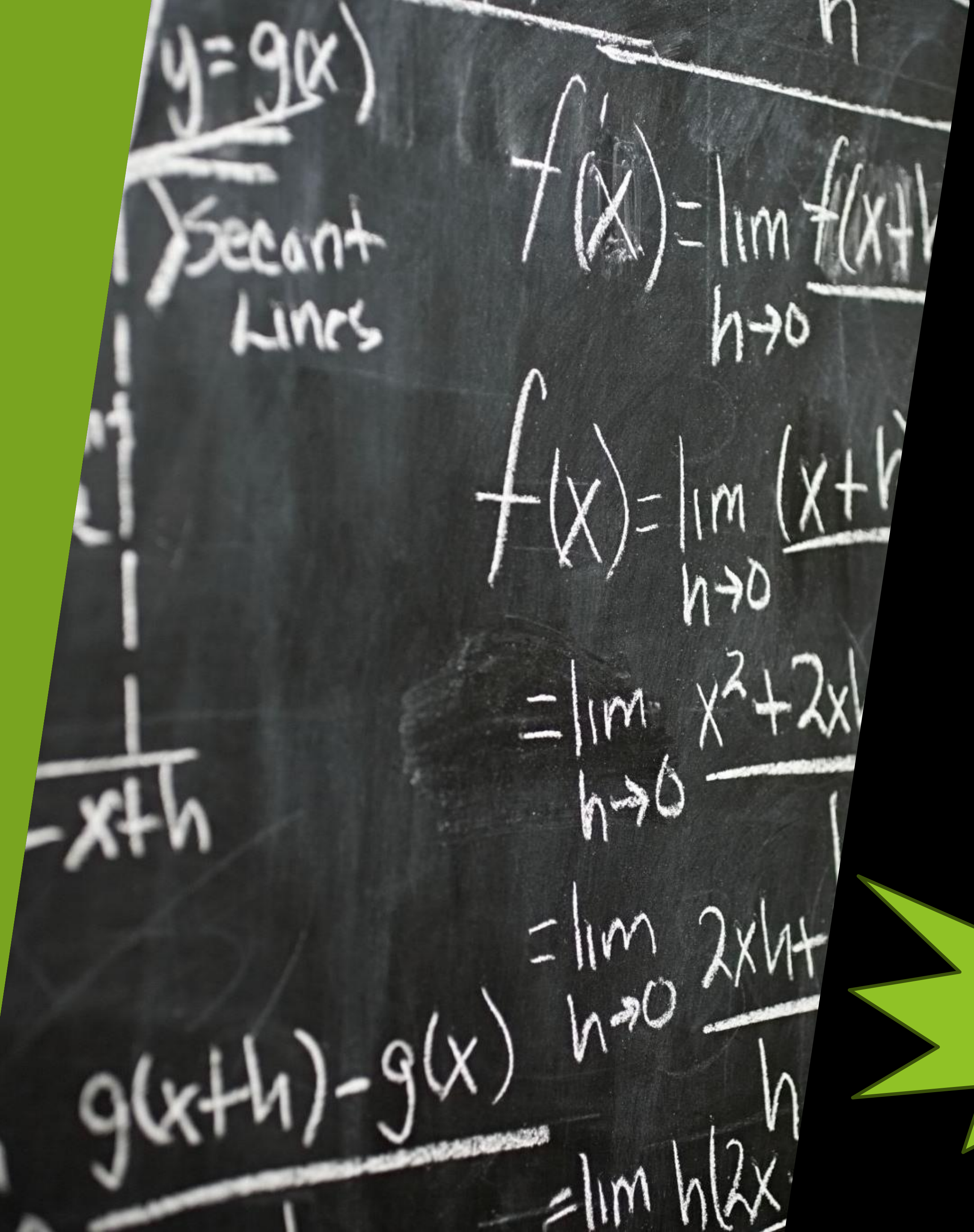

Introductory Mathematics

Past Paper Discussion

2015

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20) When the denominator of $\frac{1}{\sqrt{2}+1}$ is rationalized in the usual way, it is equal to

(a) $\frac{\sqrt{2}-1}{2}$	$\boxed{\text{(b) } \sqrt{2}-1}$	(c) $\frac{\sqrt{2}-1}{3}$
(d) $\frac{\sqrt{2}+1}{3}$	(e) $\sqrt{2}-2$	

conjugate

$(x-1) \longrightarrow (x+1)$ $\quad \sqrt{2}-1$

$(x+1) \longrightarrow (x-1)$

$$\frac{1.\left[\sqrt{2}-1\right]}{\left(\sqrt{2}+1\right)\left[\sqrt{2}-1\right]}$$

$$\frac{1.\left[\sqrt{2}-1\right]}{\sqrt{2}.\sqrt{2}-1.1}$$

$$\frac{\sqrt{2}-1}{2-1}$$

$$\frac{\sqrt{2}-1}{1}$$

21) Which of the following numbers are divisible by 2,3,4 and 6?

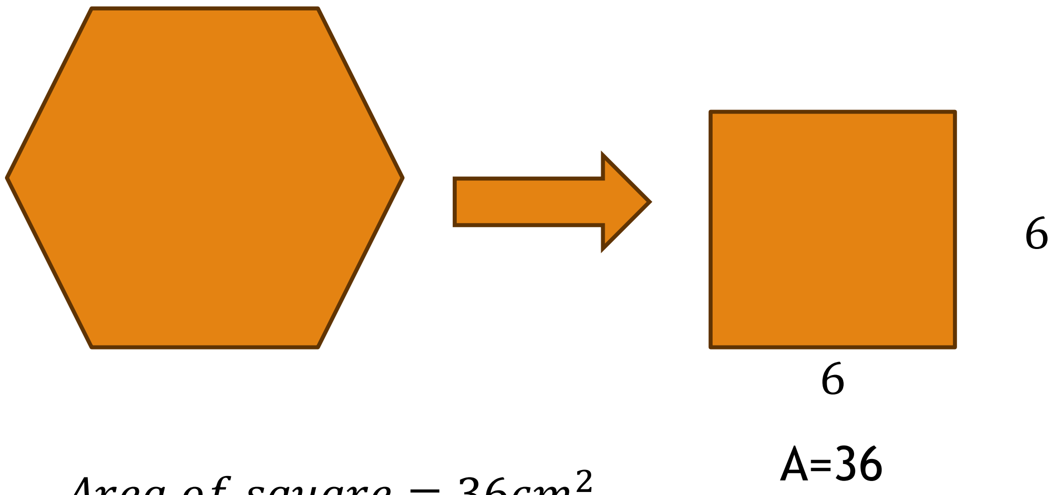
(a) 2438	(b) 5262	(c) 2256
(d) 2846	(e) 2652	

22) What are the prime factors of 100?

(a) 2 and 5	(b) 2, 5 and 10	(c)2,10 and 25	(d) 2,3 and 5	(e)2,4 and 5

23) If the perimeter of a regular hexagon and that of a square of area $36cm^2$ are equal, then each side of the hexagon is of length

(a) 3 cm	(b) 2 cm	$\boxed{\text{(c) 4 cm}}$	(d) 6 cm	(e) 8 cm



$$length\ of\ regular\ hexagon = 24/6$$

$$length\ of\ regular\ hexagon = 4$$

$$Area\ of\ square = 36cm^2$$

$$length\ of\ square = \sqrt{36}$$

$$= 6$$

$$permeter\ of\ regular\ hexagon = permeter\ of\ regular\ square$$

$$= length\ of\ sides\ X\ no.of\ sides$$

$$= 6 * 4$$

$$= 24$$

24) If the length l cm and breadth b cm of a rectangle satisfies $3.5 \leq l \leq 6$ and $3 \leq b \leq 4.5$, then the smallest and the largest possible areas of the rectangle are respectively

(a) $15.75cm^2$ and $18cm^2$ (b) $10.5cm^2$ and $18cm^2$ (c) $13.5cm^2$ and $21cm^2$

(d) $10.5cm^2$ and $27cm^2$ (e) $10.5cm^2$ and $26cm^2$

$$A = l \times b$$

$$A_{min} = l \times b$$

$l = 3.5$ $\quad$ $b = 3$

$$A_{min} = 3.5 \times 3$$

$$A_{min} = 10.5$$

$$A = l \times b$$

$$A_{max} = l \times b$$

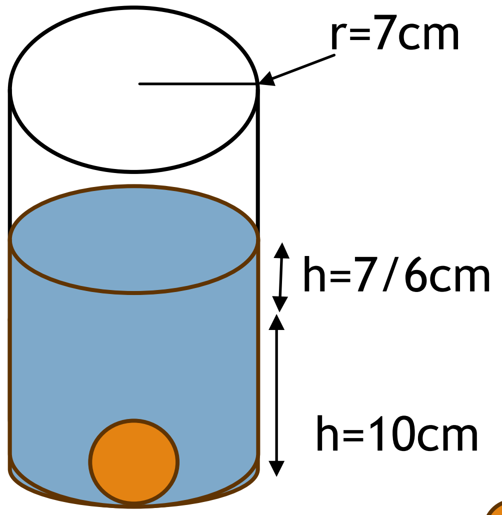
$l = 6$ $\quad$ $b = 4.5$

$$A_{min} = 6 \times 4.5$$

$$A_{min} = 27$$

25) A cylindrical container of radius 7 cm contains water to a height of 10 cm. When a sphere is completely immersed in the water, the water level rises up to $\frac{7}{6}$cm. What is the radius of the sphere?

(a) 2 cm	(b) 2.5 cm	(c) 3 cm	(d) 3.5 cm	(e) 4 cm



$$V = \pi r^2 h$$

$$v_0 = \pi 7^2 10 \longrightarrow 1$$

$$v_0 = \pi 7^2 (10 + \frac{7}{6})$$

$$v_0 = \pi 7^2 (\frac{60}{6} + \frac{7}{6})$$

$$v_0 = \pi 7^2 (\frac{67}{6}) \longrightarrow 2$$

$$2 - 1$$

$$v_f = \pi 7^2 \left(\frac{67}{6}\right) - \pi 7^2 10$$

$$v_f = \pi 7^2 \left[\left(\frac{67}{6}\right) - 10\right]$$

$$v_f = \pi 7^2 \left[\left(\frac{67}{6}\right) - \frac{60}{6}\right]$$

$$v_f = \pi 7^2 \left[\left(\frac{7}{6}\right)\right]$$

$$v_s = \frac{4}{3}\pi r^3$$

$$\pi 7^2 \left[\left(\frac{7}{6}\right)\right] = \frac{4}{3}\pi r^3$$

$$3.7^2 \left[\left(\frac{7}{6}\right)\right] = \frac{4}{3} r^3 .3$$

$$\left[\left(\frac{7^3}{2}\right)\right] = 4r^3$$

$$\left[\left(\frac{7^3}{2}\right)\right] = 4r^3$$

$$\left[\left(\frac{7^3}{8}\right)\right] = r^3$$

$$\left[\left(\frac{7^3}{2^3}\right)\right] = r^3$$

$$\sqrt[3]{\frac{7^3}{2^3}} = \sqrt[3]{r^3}$$

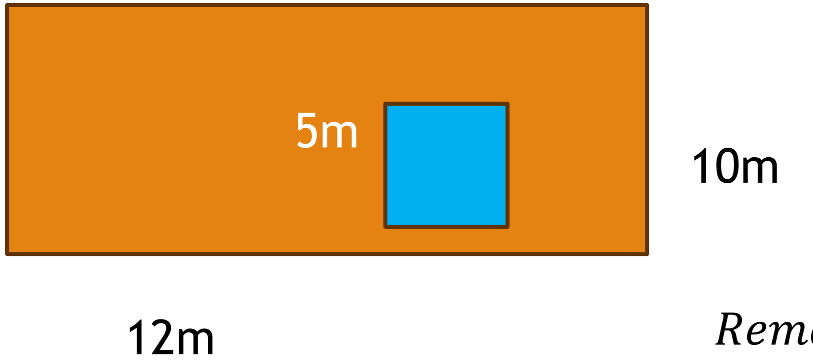
$$\frac{7^{3\cdot\frac{1}{3}}}{2^{3\cdot\frac{1}{3}}} = r$$

$$\frac{7}{2} = r$$

$$3.5 = r$$

26) A rectangular land of dimensions 12 m and 10 m has a square pond of side 5 m. What is the area of the land excluding the pond?

(a) $80m^2$	(b) $90m^2$	(c) $85m^2$	(d) $95m^2$	(e) $105\ m^2$



$$Area\ of\ Land\ A_L = 12m * 10m$$
$$A = 120$$

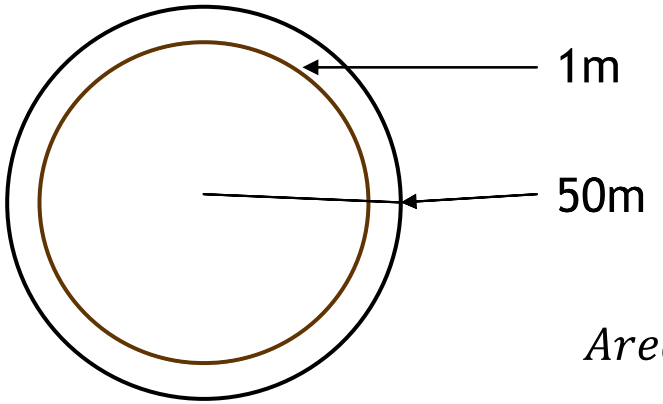
$$Area\ of\ Pond\ A_P = 5m * 5m$$
$$A = 25$$

$$Remaining\ Area = 120 - 25$$

$$A_r = 95$$

27) A circular ground has a tarred path of width 1 m around the outer edge of the ground. If the outer radius of the ground including the path is 50 m, find the area of the path

$\boxed{\text{(a) } 99\pi\, m^2}$	(b) $101\pi\, m^2$	(c) $2500\pi\, m^2$	(d) $2401\pi\, m^2$	(e) $199\pi\, m^2$



$$Area\ of\ outer\ circle\ A_0 = \pi r^2$$

$$A = \pi r^2$$

$$A = \pi 50^2$$

$$Area\ of\ inner\ circle\ A_{\mathrm{i}} = \pi r^2$$

$$A = \pi 49^2$$

$$Area\ of\ \text{path} = \pi 50^2 - \pi 49^2$$

$$A_p = \pi(50^2 - 49^2)$$

$$A_p = \pi((50 - 49)(50 + 49))$$

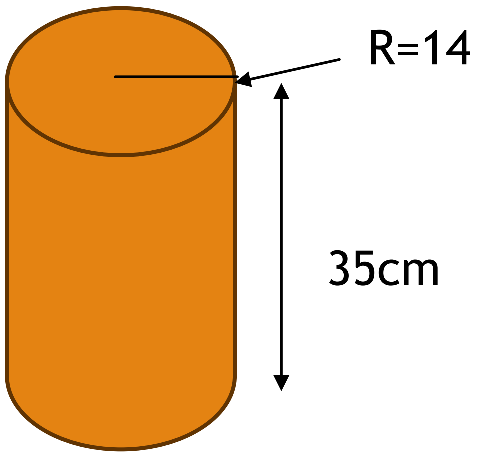
$$A_p = \pi((1)(50 + 49))$$

$$A_p = \pi((1)(99))$$

$$A_p = \pi 99$$

28) A cylindrical container of radius 14 cm and height 35 cm is full of water. This water is poured into glasses each of capacity 380 ml. How many glasses can be filled fully?

(a) 57	(b) 66	(c) 65	$\boxed{\text{(d) 56}}$	(e) 60



$$Voulme\ of\ cylinder\ V = \pi r^2 h$$

$$V = \frac{22}{7}.14.14.35$$

$$V = 21560cm^3$$

$$1cm^3 = 1ml$$

$$Number\ of\ cups = 21560cm^3/380$$

$$Number\ of\ cups = 56.7368$$

29) The price of a text book is Rs 200 more than the price of five 80 page books. If the priceof the text book is Rs400 , what is the price of an 80 page exercise book in rupees?

(a) 50	$\boxed{\text{(b) 40}}$	(c) 45	(d) 55	(e) 60

Price of Text Book = x

Price of 80 pages book = y

Price of Text Book (x) = 5y+200

$$x = 5y + 200$$

$$x = 400$$

$$400 = 5y + 200$$

$$5y + 200 = 400$$

$$5y + 200 - 200 = 400 - 200$$

$$5y = 200$$

$$\frac{5y}{5} = \frac{200}{5}$$

$$y = 40$$

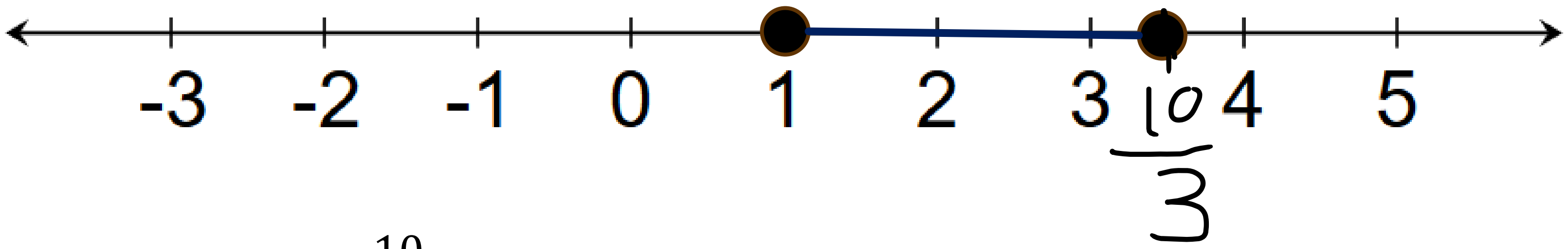
30) The elements of the set $S = \{ X \in Z : 3 \leq 3x \leq 10 \}$ are

(a) 1,2,3,4 (b) 2,3 (c) 3,4,5,…,10 (d) 1,2,3,…,10 (e) 1,2,3

$$3 \leq 3x$$

$$\frac{3}{3} \leq \frac{3x}{3}$$

$$1 \leq x$$



$$3x \leq 10$$

$$\frac{3x}{3} \leq \frac{10}{3}$$

$$x \leq \frac{10}{3}$$

$$1 \leq x \leq \frac{10}{3}$$

31) If $\frac{1}{4} < x \leq \frac{1}{2}$ then,

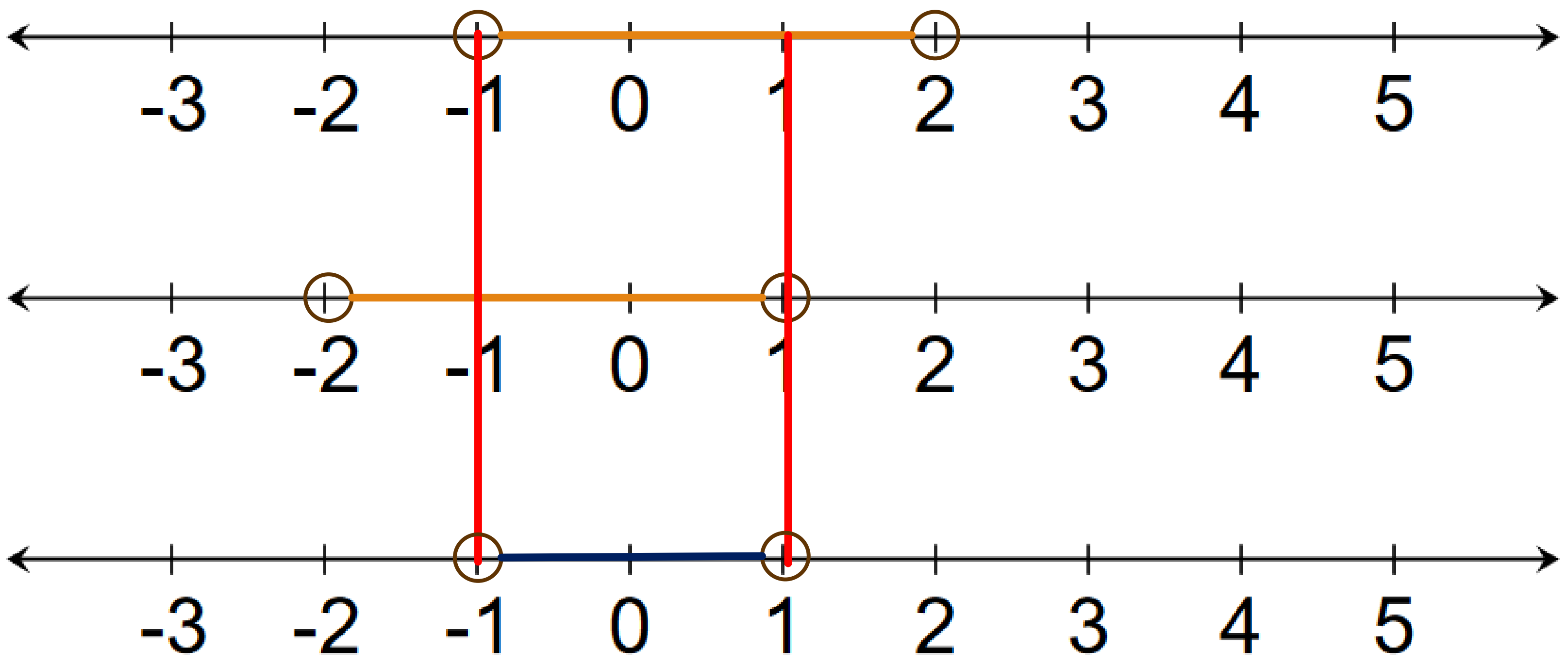
(a) $4 > x > 2$ (b) $2 < x \leq 4$ (c) $4 > x \geq 2$ (d) $2 \leq x < 4$
(e) $2 \leq x \leq 4$

13	●	b	c	d	e	33	a	●	c	d	e	53	a	b	c	d	e
14	a	b	c	●	e	34	a	b	●	d	e	54	a	b	c	d	e
15	a	b	●	d	e	35	a	b	●	●	e	55	a	b	c	d	e
16	a	b	c	●	e	36	a	●	c	d	e	56	a	b	c	d	e
17	a	●	c	d	e	37	●	b	c	d	●	57	a	b	c	d	e
18	●	b	c	d	e	38	a	●	c	d	e	58	a	b	c	d	e
19	a	b	●	d	e	39	●	b	c	d	e	59	a	b	c	d	e
20	a	●	c	d	e	40	a	b	c	d	●	60	a	b	c	d	e

*Answer for Q19 is only (c)
*No answer for Q31. Full marks.

32) The values of x satisfying $-1 < x < 2$ and $-2 < x < 1$ are

(a) $-1 < x < 2$	$\boxed{\text{(b) } -1 < x < 1}$	(c) $-2 < x < 2$	(d) $1 < x < 2$	(e) $-2 < x < 1$



33) If $\frac{1}{x} - x = 5$ then $\frac{1}{x^2} + x^2$ is equal to

(a) 25	$\boxed{\text{(b)27}}$	(c) 23	(d) 30	(e) 20

$$\left(\frac{1}{x} - x\right)^2 = 5^2$$

$$\left(\frac{1}{x^2} - 2\frac{1}{x}x + x^2\right) = 25$$

$$\left(\frac{1}{x^2} - 2 + x^2\right) = 25$$

$$\left(\frac{1}{x^2} - 2 + x^2 + 2\right) = 25 + 2$$

$$\left(\frac{1}{x^2} + x^2\right) = 27$$

34) The recurring decimal number $0.1272\dot{2}\dot{7}$ equal to

(a) $\frac{6}{55}$ (b) $\frac{9}{55}$ (c) $\boxed{\frac{7}{55}}$ (d) $\frac{7}{65}$ (e) $\frac{9}{65}$

$$\frac{6}{55} = 0.1090$$

$$\frac{9}{55} = 0.163636363636363636$$

$$\frac{7}{55} = 0.127272727272727$$

35) The solutions of $x^2 - 2x = 5$ are

(a) $\sqrt{5}+1$	(b) $-\sqrt{5}+1$	(c) $\sqrt{6}+1$	(d) $-\sqrt{6}+1$	(e) $-\sqrt{6}-1$

$$ax^2 + bx + c = 0$$

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

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

a=1, b=-2 , c=-5

$$x = \frac{-(-2) \pm \sqrt{-2^2 - 4.1.-5}}{2.1}$$

$$x = \frac{-(-2) \pm \sqrt{-2^2 - 4.1.-5}}{2}$$

$$x = \frac{2 \pm \sqrt{4 - 4.-5}}{2}$$

$$x = \frac{2 \pm \sqrt{4} + 20}{2}$$

$$x = \frac{2 \pm \sqrt{24}}{2}$$

$$x = \frac{2 \pm \sqrt{4 \times 6}}{2}$$

$$x = \frac{2 \pm 2\sqrt{6}}{2}$$

$$x = \frac{2(1 \pm 1\sqrt{6})}{2}$$

$$x = (1 \pm 1\sqrt{6})$$

$$x = (1 + \sqrt{6})$$

$$x = (1 - \sqrt{6})$$

36) When a number is added to the numerator and the denominator of $\frac{2}{3}$ we get $-\frac{1}{2}$. What is the number?

(a) $\frac{7}{3}$	$\boxed{\text{(b) } -\frac{7}{3}}$	(c) $\frac{2}{3}$	(d) $\frac{-5}{3}$	(e) $\frac{-2}{3}$

$\frac{2}{3}$ ← Numerator (2), Denominator (3)

$$\frac{2}{3} \begin{array}{l} \longleftarrow \text{Numerator} \\ \longleftarrow \text{Denominator} \end{array}$$

$$\frac{2+x}{3+x} = -\frac{1}{2}$$

$$-(3+x) = 2(2+x)$$

$$(-3-x) = (4+2x)$$

$$(-3-x) - 2x = (4+2x)\text{-}2x$$

$$-3 - 3x = 4$$

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

$$-3x = 7$$

$$-3x = 7$$

$$x = \frac{-7}{3}$$

37) If $x - y = k$ and $xy = 2k$, then $x^2 + y^2$ equal to

$\boxed{(a) k^2 + 4k}$	(b) $k(k-4)$	(c) $k(k+2)$	(d) $k^2 + 4$	$\boxed{(e) k(k+4)}$

$(x - y)^2 = x^2 + 2xy + y^2$

$(x - y)^2 = k^2$

$x^2 - 2xy + y^2 = k^2$

$x^2 - 2.2k + y^2 = k^2$

$x^2 - 4k + y^2 = k^2$

$x^2 - 4k + y^2 + 4k = k^2 + 4k$

$x^2 + y^2 = k^2 + 4k$

$x^2 + y^2 = k(k+4)$

38) The sum of three consecutive positive integers is 243, Then the smallest of these numbers is

(a) 79 (b) 80 (c) 81 (d) 82 (e) 78

$$a + b + c = x$$

$$79 + 80 + 81 = 240$$

$$80 + 81 + 82 = 243$$

40) $a(b-c)+b(c-a)+c(a-b)$ is equal to

(a) $ab+cb$	(b) $ab+bc+ca$	(c) $ab-bc+ca$	(d) $ab+bc-ca$	(e) 0

$$ab-ac+bc-ba+ca-cb$$

$$ab-ac+bc-ab+ac-bc$$

Thank You!