1 Basis of arithmetic

Section A

2012-1.

$$\frac{(-7)+5(-4)}{-3}=\frac{(-7)+(-20)}{-3}$$

$$=\frac{-27}{-3}=9\ldots\text{Answer}$$

2012-11.

a.

$32_6 = 3\times6^1+3\times6^0$

$= 18+3\times1 = 18+3 = 21_{10}$

$\therefore 278_{10}-21_{10}=257_{10}$...Answer

2010-10.

a.

2) 9
2) 4 ...1
2) 2 ...0
2) 1 ...0
0 ...1

Read the remainders from down to up.

$\therefore 1001_2$...Answer

2009-3.

$2110_3-2202_3+1021_3$

$=2110_3+1021_3-2202_3$

$$\begin{array}{rr} 2110 & 10201 \\ \underline{+\,1021} & \underline{-\,2202} \\ 10201 & 222 \end{array}$$

$\therefore 222_3$...Answer

2008-1.

$$\frac{(-5)\times(-3)+6}{(-7)}=\frac{15+6}{-7}=\frac{21}{-7}=-\frac{3}{1}=-3$$

2008-6.

$3^3(3\times3\times3)$	$3^2(3\times3)$	$3^1(3)$	$3^0(1)$
1	2	0	1

$1201_3 = 1\times3^0+0\times3^1+2\times3^2+1\times3^3$

$=1\times1+0\times3+2\times9+1\times27$

$=46_{10}$ ... Answer

2007-2.

$8(-5)+2(3)-5=-40+6-5$

$=-39$...Answer

2006-1.

$(-10)(2)\div(-4)$

$=(-20)\div(-4)=5$...Answer

2006-4.

8) 1024
8) 128 ...0
8) 16 ...0
8) 2 ...0
0 ...2

Read the remainders from down to up.

$\therefore 1024_{10}=2000_8$...Answer

2005-3.

$321_{12} = 3\times12^2+2\times12^1+1\times12^0$

$=432+24+1=457$...Answer

2004-5.

a. $112_3+102_3=221_3$...Answer

2003-1.

$(-4)-(-5)=-4+5=1$...Answer

2003-3.

$1264_7 = 1\times7^3+2\times7^2+6\times7^1+4\times7^0$

$=343+98+42+4=487_{10}$...Answer

Section B

2011-16.

b. $140_5 = 1\times5^2+4\times5^1+0\times5^0$

$=25+20+0$

$=45_{10}$...Answer

2 Indices and logarithms

Section A

2012-13.

a.

$m^0 + 49^{\frac{1}{2}} = 1 + \sqrt{49} = 1 + 7$

$= 8$...Answer

2012-14.

b.

$\log 47.89 = 1.6802$

$\therefore \log\sqrt{47.89} = (\log 4.789) \div 2$

$= 1.6802 \div 2 = 0.8401$

$\therefore \sqrt{47.89} = 10^{\log\sqrt{47.89}} = 10^{0.8401}$

$= 6.9203 \approx 6.92$(2d.p.)...Answer

2011-3.

$(3k)^2 - (4k^4)^{\frac{1}{2}} = 9k^2 - 2k^2$

$= 7k^2$...Answer

2011-14.

b.

$\log\frac{1391.0}{17.7} = \log 1391.0 - \log 17.7$

In logarithm tables,

$\log 13.91 = 1.1433$

$\therefore \log 1391.0 = \log(100 \times 13.91)$

$= 2 + 1.1433 = 3.1433$

$\log 17.7 = 1.2480$

$\therefore \log 1391.0 - \log 17.7 = 3.1433 - 1.2480$

$= 1.8953$

$\log 78.57 = 1.8949 + 0.0004 = 1.8953$

$\therefore \frac{1391.0}{17.7} = 10^{1.8956} = 78.63$

$= 79$(to 2s. f)...Answer

2010-11.

$3^2e^4 \div 3e^{-4} = 9e^4 \div \frac{3}{e^4}$

$= 9e^4 \times \frac{e^4}{3} = 3e^8$ ... Answer

2009-9.

$\log(51.8)^{\frac{1}{3}} = \frac{1}{3} \times \log(51.8)$

$\log 51.8 = 1.7143$

(from the table "LOGARITHMS)

$\log(51.8)^{\frac{1}{3}} = \frac{1}{3} \times 1.7143 = 0.571433$

$= 0.6$...Answer

2009-10.

a.

$\frac{(p^2q^2)^{\frac{1}{2}}}{q} = \frac{p^{2\times\frac{1}{2}}q^{2\times\frac{1}{2}}}{q} = \frac{pq}{q}$

$= p$ ... Answer

2008-2.

$y(y^{-2})5 = y(y^{-2\times5}) = y(y^{-10})$

$= y \times y^{-10} = y^1 \times y^{-10}$

$= y^{-9}$...Answer

2008-13.

$\log(4.56)^3 = 3\log(4.56)$.

According to the log table 45.6 is 6.590.

$\log(45.6) = 6590$

$\log(4.56) = 0.6590$

$\log(4.56)^3 = 3 \times 0.6590 = 1.977$...Answer

2007-8.

$\log 66.79 = 1.8247$

$\therefore \log\sqrt{667.9} = (\log 667.9) \div 2$

$= (1 + 1.8247) \div 2 = 1.41235$

$\therefore \sqrt{667.9} = 10^{1.41235} = 10 \times 10^{0.41235}$

$= 25.84$...Answer

2007-9.

$2m(3m)^2 = 2m \times 9m^2 = 18m^3$...Answer

2006-11.

$\log 41.3 = 1.6160$

$\therefore \log(4.13)^2 = \log(41.3 - 1) \times 2 = 1.232$

$(4.13)^2 = 10^{1.232} = 10 \times 10^{0.232}$

$= 10 \times 1.706 = 17.06$

≈ 17.1(to 3 s. f.)...Answer

2005-2.

$64^{\frac{1}{3}} + 2^2 = (2^6)^{\frac{1}{3}} + 2^2$

$= 2^{6\times\frac{1}{3}} + 2^2 = 2^2 + 2^2$

$= 4 + 4 = 8$...Answer

2003-12.

$\log_{10}\left(\frac{41 \times 67^2}{161}\right)$

$= \log_{10} 41 \times \log_{10} 67^2 - \log_{10} 161$

$= \log_{10} 41 \times 2\log_{10} 67 - \log_{10} 161$

$= (\log_{10} 10 + \log_{10} 4.1) + 2(\log_{10} 10 + \log_{10} 6.7)$

$- (\log_{10} 100 + \log_{10} 1.61)$

$= 1.6128 + 2 \times 1.8261 - 2.2068 = 3.0582$

Antilogarithm of $0.0582 = 1.144$

Antilogarithm of $3.0582 = 1144$...Answer

Section B

2010-18.

$\log(2.7 \times 40.3) = \log 2.7 + \log 40.3$

From logarithm tables, $\log 27 = 1.4314$ and

$\log 40.3 = 1.6053$

$\therefore \log 2.7 = 0.4314$

$\log 2.7 + \log 40.3 = 0.4314 + 1.6053 = 2.0367$

$\therefore 2.7 \times 40.3 = 10^{2.0367}$

$\log 10.88 = 1.0334 + 0.0033 = 1.0367$

$\therefore \log 108.8 = 2.0367$

$\therefore 2.7 \times 40.3 = 10^{2.0367} = 108.8$

$= 110$ (to 2 s. f.)

2007-16.

$\log\frac{36.7}{\sqrt{2.8}} = \log 36.7 - \log 2.8^{\frac{1}{2}}$

$= \log 36.7 - \frac{1}{2}\log 2.8$

$\log 36.7 = 1.5674, \log 28.0 = 1.4314$

$\therefore \log 2.8 = \log\left(\frac{1}{10} \times 28.0\right)$

$= \log\frac{1}{10} + \log 28.0 = \log 10^{-1} + \log 28.0$

$= -1 + 1.4472 = 0.4472$

$\therefore \log 36.7 - \frac{1}{2}\log 2.8 = 1.5674 - \frac{1}{2} \times 0.4472$

$= 1.5674 - 0.2236 = 1.3438$

$\therefore \frac{36.7}{\sqrt{2.8}} = 10^{1.3438} = 22.0191 \ldots$

$\fallingdotseq 22$...Answer

2005-17.

$a^2 \times a^{-4} \div a = a^{2+(-4)-1}$

$= a^{-3}$...Answer

2005-19.

b.

$\log 1.25 = 0.0969$

$\log\sqrt{12.5} = \frac{1}{2}\log 12.5$

$= \frac{1}{2} \times (1 + 0.0969) = 0.54845$

$\therefore \sqrt{12.5} = 10^{0.54845}$

$= 3.535 \approx 3.54$(2d. p.)..Answer

2004-17.

Using the logarithm table

$\log 1.23 = 0.0899 \therefore \log 123 = 2.0899$

$\log 2.73 = 0.4362 \therefore \log 27.3 = 1.4362$

$\log 2.631 = 0.4202$

$\log\frac{123 \times 27.3}{2.631} = \log 123 + \log 27.3 - \log 2.631$

$= 2.0899 + 1.4362 - 0.4202 = 3.1059$

Using the antilogarithm table

$10^{0.1059} = 1.274 + 0.003 = 1.277$

$\therefore \frac{123\times27.3}{2.631} = 10^{3.1059} = 1277$...Answer

3 Social and commercial arithmetic

Section A

2012-6.

surtax of a shirt $= \text{K}400 \times \frac{15}{100} = \text{K}60$

total amount of money

$= \text{K}400 + \text{K}60 + 2 \times \text{K}120$

$= \text{K}460 + \text{K}240 = \text{K}700$...Answer

2010-4.

Depreciation $100\% - 7\% = 93\%$

Let the original value of the bicycle be x

$x \times \frac{93}{100} = 9300$

$x \times \frac{93}{100} \times \frac{100}{93} = 9300 \times \frac{100}{93}$

$x = 10000$

$\therefore$ K10,000...Answer

2009-5.

electricity bill = unit cost × number of units + fixed charge

$= \text{K}14.50 \times 192 + \text{K}350.00$

$= \text{K}2784.00 + \text{K}350.00 = \text{K}3134.00$...Answer

2008-7.

The K 17 500 of K 60 000 is not taxable.

Taxed income = K 60 000 − K 17 500 = K 42 500

Income tax = rate × taxable salary

$15\ \% \times \text{K}\ 42\ 500 = \frac{15}{100} \times \text{K}42500$

$= 15 \times 425 = 6375$

K 6375 per month

K 6375 × 12 month = K 76 500...Answer

2006-12.

b. If K441.00 includes tax at 5%, then

105% of basic cost = K441.00

$\therefore$ The original price of the product

$= \text{K}441.00 \times \frac{100}{105} = \text{K}420.00$ ... Answer

2005-10.

The value of the car at the beginning of the first year = 95% of K540,000 = K513,000

The value of the car at the beginning of the second year = 95% of K513,000

= K487,350...Answer

2004-8.

$\text{K}24400 = \text{K}4800 + \text{K}9600 + \text{K}10000$

0% of K4800 = K0

10% of K9600 = K960

25% of K10000 = K2500

the total income tax = K960 + K2500

= K3460...Answer

Section B

2011-16.

a.

Let the amount of policies sold be x.

$x \times \frac{20}{100} = \text{K}2000$

$x = \text{K}2000 \times \frac{100}{20} = \text{K}10000$

The amount of policies sold is K10000...Answer

2007-17.

b.

Total sell $= \text{K}60 \times 1000 = \text{K}60{,}000$

Commission $= \text{K}60{,}000 \times 10\%$

$= \text{K}60{,}000 \times \frac{10}{100} = \text{K}6{,}000$ ... Answer

2003-19.

b.

$\text{K}800 - \text{K}720 = \text{K}80$

The discount percentage $= \frac{80}{800} \times 100$

$= 10\%$...Answer

4 Number patterns

Section A

2012-15.

b.

$P-(-8)=12-P$

$P+8=12-P$

$P+P=12-8$

$2P=4$

$P=2$...Answer

2010-12.

This sequence is an AP with the common difference $(+4)$.

$a_n=a_1+(n-1)d$, where

$a_1=7, a_n=283$ and $d=4$

$\therefore 283=7+(n-1)4$

$-4n=-280$

$n=70$

$\therefore$ The number of terms is 70...Answer

2009-6.

1st term $=1+(1+1)$

2nd term$=2+(2+1)$

3rd term$=3+(3+1)$

nth term$=n+(n+1)=2n+1$...Answer

2008-10.

$17-(-7)=17+7=24$

$7+\frac{24}{2}=-7+12=5$

$\therefore b=5$...Answer

2007-13.

$2n-1=11$

$2n=12$

$n=6$

$\therefore$ The number of terms is 6...Answer

2007-15.

NUMBER	PATTERN	TOTAL
1	1	1
2	1+2+1	4
3	1+2+3+2+1	9
4	1+2+3+4+3+2+1	16
5	**1+2+3+4+5+4+3+2+1**	**25**

2006-2.

$a_5=5^2+5$

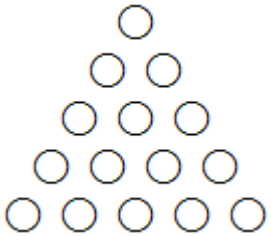
$=25+5=30$...Answer

2004-5.

b. 9^2

2003-2.

a.



The number of dots of the 4th triangle is 15...Answer

Section B

2011-19.

a.

(i)

$a_1=3\times1-2=1$

$a_2=3\times2-2=4$

$a_3=3\times3-2=7$

$\therefore$ The first three terms are 1,4,7...Answer

(ii)

$a_n=a_1+(n-1)d$

The nth term of a sequence is $3n-2$...Answer

5 Density and mixture

Section A

2012-11.

b.Volume of cylinder $= \pi r^2 h$

$= \left(\frac{22}{7} \times \frac{14}{2} \times \frac{14}{2} \times 10\right) \text{cm}^3$

$= (22 \times 7 \times 10)\text{cm}^3$

$= 1540\text{cm}^3$

$\text{Density} = \frac{\text{Mass}}{\text{volume}}$

$= \frac{3080\text{ g}}{1540\text{ cm}^3} = 2\text{ g/cm}^3$ ... Answer

2011-7.

$101\text{g} - 77\text{g} = 24\text{g}$ is the mass of the water.

$107\text{g} - 77\text{g} = 30\text{g}$ is the mass of the glycerin.

The relative density of the glycerin is

$\frac{30\text{g}}{24\text{g}} = 1.25$ ... Answer

2010-13.

$\text{Mass} = \frac{\text{Density}}{\text{Volume}} = 0.7 \times 1800$

$= 1260\text{g}$...Answer

2008-4.

Relative density = Mass of substance/Volume of substance

Volume of mathematical instrument box: x cm^3

$2.1 = \frac{273}{x}$

$x = \frac{273}{2.1} = 130$

$\therefore 130\text{cm}^3$...Answer

2007-10.

White suger cost + Brown suger cost

$= \text{K}200 + \text{K}270 = \text{K}470$

The cost of the mixture per kg

$= \frac{\text{K}470}{5\text{kg}} = K94/\text{kg}$ ... Answer

2005-13.

The weight of petrol $= 55 - 20 = 35\text{g}$

The weight of water $= 70 - 20 = 50\text{g}$

The relative density $= \frac{35}{50} = 0.7$ ... Answer

2003-15.

The volume of the container $= 645 - 105$

$= 540\text{cm}^3$

The mass of liquid H $= 915 - 105$

$= 810\text{g}$

The Density of liquid H $= \frac{810\text{g}}{540\text{cm}^3}$

$= 1.5\text{g/cm}^3$...Answer

Section B

2011-17.

b.

Let the height of the cylinder be x.

$\left(\frac{7}{2}\right)^2 \times \pi \times x = 385$

$\frac{49}{4} \times \frac{22}{7} \times x = 385$

$\frac{77}{2}x = 385$

$x = 385 \times \frac{2}{77} = 10$

$\therefore$ The height is 10cm ...Answer

2010-19.

b.

Let white beans is x kg and red beans is $(1 - x)$kg.

$146 \times x + 170 \times (1 - x) = 152$

$-24x = -18$

$\therefore x = \frac{3}{4}, 1 - x = 1 - \frac{3}{4} = \frac{1}{4}$

$\therefore$ white: red $= \frac{3}{4} : \frac{1}{4} = 3:1$ ... Answer

6 Proportions

Section A

2011-10.

a.

$\frac{4 \times 30}{6} = \frac{120}{6} = 20\text{days} \ldots \text{Answer}$

2009-10.

b.

percentage change

$= \frac{(\text{original value} - \text{new value})}{\text{original value}} \times 100$

$= \frac{700 - 616}{700} \times 100 = \frac{84}{700} \times 100$

$= 12\% \ldots \text{Answer}$

2008-14.

Expenditure on food is 30 % so multiply monthly salary by 30 %.

$\text{K}38000 \times 30\ \% = 38000 \times \frac{30}{100} = 380 \times 30$

$= \text{K}11400 \ldots \text{Answer}$

2007-11.

Let the total number of pupils at the school be x.

$x \times 60\% = 48$

$x \times \frac{60}{100} = 48$

$x = 48 \times \frac{100}{60}$

$x = 80$

$\therefore$ The total number of pupils are 80 …Answer

2006-6.

25 litre $=$ 25000ml

The number of bottles which can be used to fill the drum is

$\frac{25000}{500} = 500 \ldots \text{Answer}$

2005-6.

$30\text{kg} \div 6 \text{ people} = 5 \text{ kg/person}$

$5 \text{ kg/person} \times (6 + 2) \text{ people} = 40\text{kg} \ldots \text{Answer}$

2004-7.

Let x be the angle represented by the sector C.

$70° + 140° + x = 360°$

$x = 150°$

$\text{the percentage} = \frac{150°}{360°} \times 100$

$= \frac{125}{3}\% \approx 41.7\% (1\text{d.p.}) \ldots \text{Answer}$

Section B

2005-18.

a.

Let the share of Chimwemwe $= x$

then the share of Chikondi $= x + 80$

$x + (x + 80) = 540$

$x = 230$

The share of Chimwemwe is K230.

The share of Chikondi is K230 + K80 = K310.

…Answer

7 Probability

Section A

2012-8.

a.

$$P(6) = \frac{\text{Favourable outcome}}{\text{Total possible outcome}}$$

$$= \frac{2}{6} = \frac{1}{3} \ldots \text{Answer}$$

2011-14.

a.

P(picking a letter N)

$$= \frac{\text{number of letter N}}{\text{total number of letters}}$$

$$= \frac{2}{10} = \frac{1}{5} \ldots \text{Answer}$$

2010-6.

P(picking a blue counter)

$$= \frac{\text{number of blue counters}}{\text{total number of counters}}$$

$$= \frac{9}{6+9} = \frac{9}{15}$$

$$= \frac{3}{5} \ldots \text{Answer}$$

2009-7.

$$P(\text{success}) = \frac{(\text{total successful outcomes})}{(\text{total possible outcomes})}$$

P(picking a white bean)

$$= \frac{20}{20+30+10} = \frac{20}{60}$$

$$= \frac{1}{3} \ldots \text{Answer}$$

2007-6.

P(choosing the letter A)

$$= \frac{\text{number of the letter A}}{\text{total number of letters}}$$

$$= \frac{2}{5} \ldots \text{Answer}$$

2003-5.

b.

The probability of choosing tail

$$= \frac{1}{2} \ldots \text{Answer}$$

8 Statistics

Section A

2010-5.

$$\text{Mean} = \frac{\text{sum of values}}{\text{number of values}}$$

$$= \frac{7+11+6+7+9}{5} = \frac{40}{5}$$

$= 8$...Answer

2009-2.

mean = sum of values ÷ number of values

sum of values = mean × number of values

sum of values $= 400 \times 3 = 1200$

the mass of the third packet

$= 1200 - 900 = 300$g...Answer

2006-5.

a.

put the number in order 1,2,3,4,4,4,7

Median = the mean of the two middle values

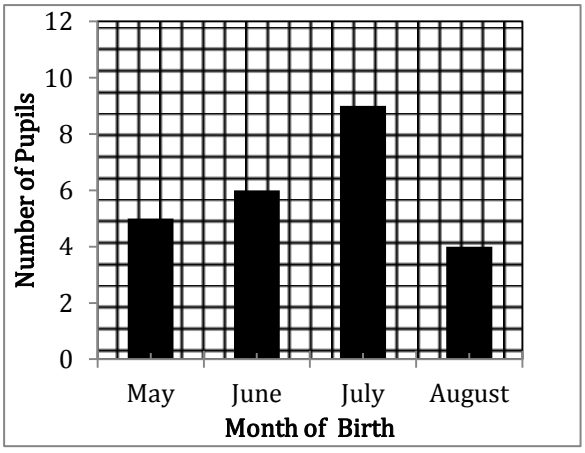
$$= \frac{(3+4)}{2} = 3.5 \ldots \text{Answer}$$

2005-4.

b. $2 + 1 + 6 + 10 + 6 = 25$...Answer

Section B

2012-17.



2011-17.

a.

Football $= 360° - 126° - 54° - 42° = 138°$

∴ Students who play football

$$= 60 \times \frac{138°}{360°} = 23 \ldots \text{Answer}$$

2008-19.

a.

$$\frac{15+20+12+10+k}{5} = 14$$

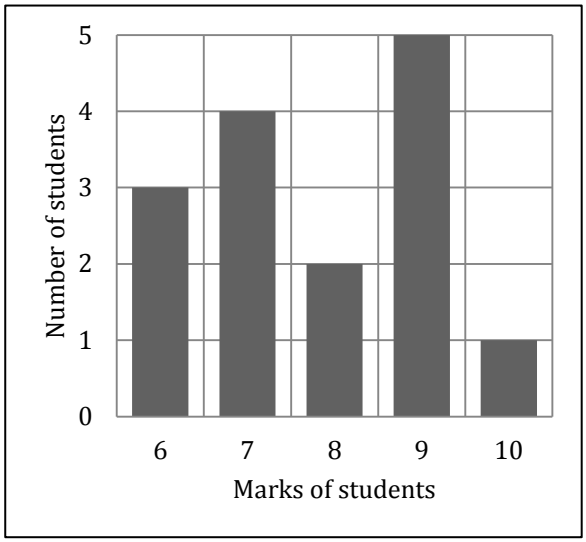
$$\frac{57+k}{5} = 14$$

$57 + k = 70$

$k = 70 - 57 = 13$...Answer

2007-18.

a.



9 Algebraic expressions

Section A

2012-3.

$2e - f + g = 2(4) - (-2) + (-5)$

$= 8 + 2 - 5 = 10 - 5$

$= 5$...Answer

2012-5.

$30\text{ef} = 2 \times 3 \times 5 \times \text{e} \times \text{f}$

$10\text{e}^2\text{f} = 2 \times 5 \times \text{e} \times \text{e} \times \text{f}$

$5\text{f}^2 = 5 \times \text{f} \times \text{f}$

$\text{LCM} = 2 \times 3 \times 5 \times \text{e} \times \text{e} \times \text{f} \times \text{f}$

$= 30\text{e}^2\text{f}^2$...Answer

2012-14.

a.

$\text{L} = \text{ra} + \text{n}$

$\text{L} - \text{n} = \text{ra}$

$\frac{\text{L} - \text{n}}{\text{a}} = \frac{\text{ra}}{\text{a}}$

$\text{r} = \frac{\text{L} - \text{n}}{\text{a}}$ ... Answer

2011-1.

$2k - 7f - 4(2k - 3f) = 2k - 7f - 8k + 12f$

$= -6k + 5f$...Answer

2011-5.

$4ar^2 = 2 \times 2 \times a \times r \times r$

$6a^2br = 2 \times 3 \times a \times a \times b \times r$

$8ac^2r = 2 \times 2 \times 2 \times a \times c \times c \times r$

$\therefore \text{HCF} = 2 \times a \times r = 2ar$...Answer

2010-1.

$a^2 - b = (-2)^2 - 5 = 4 - 5$

$= -1$...Answer

2010-7.

a.

$\frac{2c - 4}{c^2 - 4} = \frac{2(c - 2)}{(c + 2)(c - 2)}$

$= \frac{2}{c + 2}$ ... Answer

2009-1.

$\frac{2pr}{t} = \frac{2 \times (-1) \times (-4)}{-2} = \frac{8}{-2}$

$= -4$...Answer

2009-4.

b.

$h = k - (g + e)$

$h = k - g - e$

$\therefore g = k - e - h$...Answer

2009-14.

a.

$x + 3y - (-x) - 4y$

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

$= 2x - y$...Answer

2008-9.

$xk - xm - kz + mz$

$= (xk - xm) - (kz - mz)$

$= x(k - m) - z(k - m)$

$= (k - m)(x - z)$ ...Answer

2008-11.

$\frac{4x}{5} \div \frac{(4x - 4)}{5} = \frac{4x}{5} \times \frac{5}{(4x - 4)}$

$= \frac{4x}{4x - 4} = \frac{4x}{4(x - 1)}$

$= \frac{x}{x - 1}$

2007-3.

$\frac{(x+y)}{(x-y)} = \frac{(2+4)}{(2-4)} = \frac{6}{-2}$

$= -3$...Answer

2007-4.

$2x = 2 \times x$

$12xy = 2 \times 2 \times 3 \times x \times y$

$18x^2y = 2 \times 3 \times 3 \times x \times x \times y$

$\therefore$ L. C. M. $= 2 \times 2 \times 3 \times 3 \times x \times x \times y$

$= 36x^2y$ ... Answer

2006-3.

$x^2 + xy = x(x+y)$ ...Answer

2005-1.

$2\text{b} - \text{ac} = 2 \times 4 - 3 \times (-2)$

$= 8 - (-6) = 8 + 6$

$= 14$...Answer

2005-15.

a. $-5(2p - 3q) = -10p + 15q$...Answer

2004-2.

$(3d - 2)^2 = 9d^2 - 12d + 4$...Answer

2004-3.

$3^3x^2yz = 3 \times 3 \times 3 \times x \times x \times y \times z$

$3^2xz^3 = 3 \times 3 \times x \times z \times z \times z$

$\therefore$ HCF $= 3 \times 3 \times x \times z$

$= 3^2xz$...Answer

2004-4.

$\frac{2}{x} - \frac{3}{x-2} = \frac{2}{x} \times \frac{x-2}{x-2} - \frac{3}{x-2} \times \frac{x}{x}$

$= \frac{2(x-2) - 3x}{x(x-2)} = \frac{-x-4}{x(x-2)}$ ... Answer

2004-11.

substitute a $= 4$, b $= -2$ and c $= -3$ into

a(b + c):

$4 \times \{(-2) + (-3)\} = 4 \times (-5)$

$= -20$...Answer

2003-2.

b. $4 - x^2 = (2-x)(2+x)$ ...Answer

2003-5.

a.

$4m^2 = 2 \times 2 \times m \times m$

$6mn^2 = 2 \times 3 \times m \times n \times n$

$10mn = 2 \times 5 \times m \times n$

The HCF is $2 \times m \times n = 2mn$...Answer

2003-6.

Substitute -5 for x, -2 for y, and 2 for m.

$\frac{3xy^2}{2m} = \frac{3 \times (-5) \times (-2)^2}{2 \times 2}$

$= -15$...Answer

2003-13.

b.

$(2b + 4)(d - 3bd) = 2bd - 6b^2d + 4d - 12bd$

$= 4d - 6b^2d - 10bd$...Answer

10 Linear equations

Section A

2012-8.

b.

$\frac{P+1}{5}+P=\frac{3}{5}$

$P+1+5P=3$

$6P=3-1$

$6P=2$

$P=\frac{1}{3}$ ... Answer

2011-2.

$\frac{2}{r-1}=2$

$\frac{2}{(r-1)}\times(r-1)=2(r-1)$

$2=2r-2$

$2r=4$

$r=2$...Answer

2011-8.

$50-(a+5)-(2a-3)=30$

$50-a-5-2a+3=30$

$48-3a=30$

$-3a=-18$

$a=6$...Answer

2009-15.

Let the width of the fence be W.

Let the length of the fence be L.

$W=L-4$

$L=W+4$

perimeter $=2(W+L)$

$\therefore 36=2\{W+(W+4)\}$

(substitute perimeter $=36$ and $L=W+4$)

$36=2(2W+4)$

$36=4W+8$

$-4W=-28$

$W=7$

the width of the fence=7metres ...Answer

2008-12.

$5x-y=8$

$-y=8-5x$

$y=5x-8$

Therefore,

(i) -8

(ii) 5

2005-4.

a.

$\frac{5m}{3}=m-2$

$3\times\frac{5m}{3}=3\times(m-2)$

$5m=3m-6$

$m=-3$...Answer

Section B

2010-20.

a.

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

$\frac{r+2}{3}=\frac{3}{2}$

$\frac{r+2}{3}\times 6=\frac{3}{2}\times 6$

$2r+4=9$

$2r=5$

$r=\frac{5}{2}=2\frac{1}{2}$ ... Answer

11 Inequalities

Section A

2012-2.

$x \geq 3$...Answer

2011-4.

$b + 1 \geq 13 - 3b$

$4b \geq 12$

$b \geq 3$...Answer

2010-3.

$n + (n + 5) < 15$

$2n < 15 - 5$

$2n < 10$

$\therefore n < 5$...Answer

2009-8.

$4y - 1 > y + 11$

$4y - y > 11 + 1$

$3y > 12$

$y > 4$...Answer

2007-7.

$2x + 10 \leq 4$

$2x \leq -6$

$x \leq -3$...Answer

2006-5.

b.

$(8y + 40) + 2y < 80$

$10y + 40 < 80$

$10y < 40$

$y < 4$ ... Answer

2005-5.

$4x - 2 > x + 4$

$3x > 6$

$x > 2$...Answer

2004-6.

$3 - x < 5$

Take 3 from both sides:

$-x < 2$

Multiply both sides by -1:

$x > -2$...Answer

2003-7.

$\frac{m}{2} - \frac{2 + m}{3} \leq 0$

$6 \times \left(\frac{m}{2} - \frac{2 + m}{3}\right) \leq 6 \times 0$

$3m - 2(2 + m) \leq 0$

$3m - 4 - 2m \leq 0$

$m \leq 4$...Answer

12 Linear simultaneous equations

Section A

2012-15.

a.

$x + 3y = 11\ (\times 4)$

$5x + 4y = 22\ (\times 3)$

$$\begin{array}{rl} & 4x + 12y = 44 \\ \underline{-)} & \underline{15x + 12y = 66} \\ & -11x \quad\quad = -22 \end{array}$$

$x = 2$

$x + 3y = 11$

$2 + 3y = 11$

$3y = 11 - 2$

$3y = 9$

$y = 3$

$\therefore x = 2, y = 3$ ...Answer

2008-15.

$2x + y = 5 \cdots$ (a)

$x + 3y = 5 \cdots$ (b)

Multiply equation (b) by 2

$2x + 6y = 10 \cdots$ (c)

Now subtract (a) from (c)

$$\begin{array}{rl} & 2x + 6y = 10 \cdots \text{(c)} \\ \underline{-)} & \underline{2x + y = 5 \cdots \text{(a)}} \\ & 5y = 5 \end{array}$$

$y = 1$

substitute $y = 1$ in (b)

$x + 3y = 5$

$x + 3 \times 1 = 5$

$x + 3 = 5$

$x = 2$

$\therefore x = 2, y = 1$ ...Answer

2004-9.

$y - x = -1 \quad (1)$

$3x - y = 5 \quad (2)$

rearrange equation(1) to solve for y:

$y = x - 1$

substitute the y value into equation(2):

$3x - (x - 1) = 5$

$3x - x + 1 = 5$

$x = 2$

substitute the x value into equation(1):

$y - 2 = -1$

$y = 1$

$\therefore x = 2, y = 1$ ...Answer

2003-14.

$7x + y = 3 \quad (1)$

$x - 2y = 9 \quad (2)$

Rearrange equation(1) to solve for y

$y = 3 - 7x$

Substitute the y value into equation(2)

$x - 2(3 - 7x) = 9$

$x - 6 + 14x = 9$

$x = 1$

Substitute the x value into equation(1)

$7 + y = 3$

$y = -4$

$\therefore x = 1, y = -4$ ...Answer

Section B

2010-17.

$2m - n = 4 \cdots$ (i)

$2m + 3n = -4 \cdots$ (ii)

Rearrange (i)

$2m = 4 + n \cdots$ (iii)

Substitute (iii) for (ii)

$(4 + n) + 3n = -4$

$4n = -8$

$n = -2 \cdots$ (iv)

Substitute (iv) for (i)

$2m - (-2) = 4$

$2m = 2$

$m = 1$

$\therefore m = 1$ and $n = -2$...Answer

2009-17.

b.

Let the cost of each banana be B.

Let the cost of each mango be M.

$B + B + M + M + M = 28$

(two bananas and three mangoes is K28)

$\therefore 2B + 3M = 28 \cdots (1)$

$B + B + B + B + B + M = 31$

(five bananas and one mango is M31)

$\therefore 5B + M = 31 \cdots (2)$

$M = 31 - 5B \cdots (3)$

substitute (3) to (1)

$2B + 3 \times (31 - 5B) = 28$

$2B + 93 - 15B = 28$

$2B - 15 = 28 - 93$

$-13B = -65$

$B = 5$

$M = 31 - 5B$

$M = 31 - 5 \times 5$

$M = 31 - 25$

$M = 6$

$\therefore$ banana K5, mango K6 ...Answer

2006-18.

a. $x + y = 29$

b. $5x + 2y = 100$

c.

$x + y = 29$ (1)

$5x + 2y = 100$ (2)

From(1),

$y = 29 - x$ (3)

Substitute$(29 - x)$for y in (2):

$5x + 2(29 - x) = 100$

$5x + 58 - 2x = 100$

$3x = 42$

$x = 14$

Substitute 14 for x in (3)

$y = 29 - 14 = 15$

Thus $x = 14$ and $y = 15$ ...Answer

13 Quadratic equations

Section A

2012-10.

$x(x-2)=35$

$x^2-2x=35$

$x^2-2x-35=0$

$(x-7)(x+5)=0$

$\therefore x-7=0$ or $x+5=0$

$\therefore x=7$ or $x=-5$

$\therefore x=7\ (\because x\geq 0)$ ...Answer

2011-10.

b.

$k^2=10k-25$

$k^3-10\mathrm{k}+25=0$

$(k-5)^2=0$

$k=5$...Answer

2010-14.

$t^2+7t+10=0$

$t(t+2)+5(t+2)=0$

$(t+5)(t+2)=0$

$\therefore t=-5$ or $t=-2$...Answer

2009-13.

$2f^2-2$

$=2(f^2-1)=2\{f^2+(1-1)f-1^2\}$

$=2(f+1)(f-1)$...Answer

2006-14.

$x^2+x=42$

$x^2+x-42=0$

$(x+7)(x-6)=0$

$x=-7$ or $x=6$

Since an age cannot be negative value, $x=6$.

$\therefore$ The woman is $6^2=36$ years old...Answer

Section B

2009-18.

b.

$y^2+4y-32=0$

$y^2+(8-4)y+8\times(-4)=0$

$(y+8)(y-4)=0$

$y=-8$ or $y=4$...Answer

2007-20.

a.

$\frac{4}{9}-4t^2=0$

$-4t^2=-\frac{4}{9}$

$t^2=\frac{1}{9}$

$t=\pm\frac{1}{3}$... Answer

2006-16.

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

$\frac{2(m+2)-m}{m(m+2)}=\frac{m(m+2)}{3m(m+2)}$

$\frac{3\{2(m+2)-m\}}{3m(m+2)}=\frac{m(m+2)}{3m(m+2)}$

$6m+12-3m=m^2+2m$

$3m+12=m^2+2m$

$m^2-\mathrm{m}-12=0$

$(m+3)(m-4)=0$

$m=-3,4$...Answer

2005-18.

b.

$AB=AC$

$x+20=x^2$

$x^2-x-20=0$

$(x-5)(x+4)=0$

$x=-4,5$...Answer

2004-18.

The area of the rectangle $= 63\text{cm}^2$

$x(x+2) = 63$

$x^2 + 2x - 63 = 0$

$(x+9)(x-7) = 0$

$x = -9,7$

The width of the rectangle is 7cm …Answer

2003-16.

Let $x =$ Mavuto's age,

then sister's age $= x + 12$.

$x(x+12) = 108$

$x^2 + 12x - 108 = 0$

$(x+18)(x-6) = 0$

$x = 6\ (\because x \geq 0)$

$\therefore$ Mavuto is 6 years old …Answer

14 Coordinates

Section A

2006-7.
$(5, 1)$

2004-14.
$Q(0,2)$ $R(-3,-4)$

15 Linear graph

Section A

2012-12.

a. $y = -3$

b.

$A(-1,-3), B(2,3)$

Gradient $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{3-(-3)}{2-(-1)} = \frac{6}{3} = 2$...Answer

2010-10.

$y = 3x + c$

Substitute the point $(1, 4)$

$4 = 3 \times 1 + c$

$4 - 3 = c$

$\therefore c = 1$...Answer

2006-12.

a. $y = 3\ (-2 \leq x \leq 3)$

2005-9.

x	-3	0	3
y	0	3	6

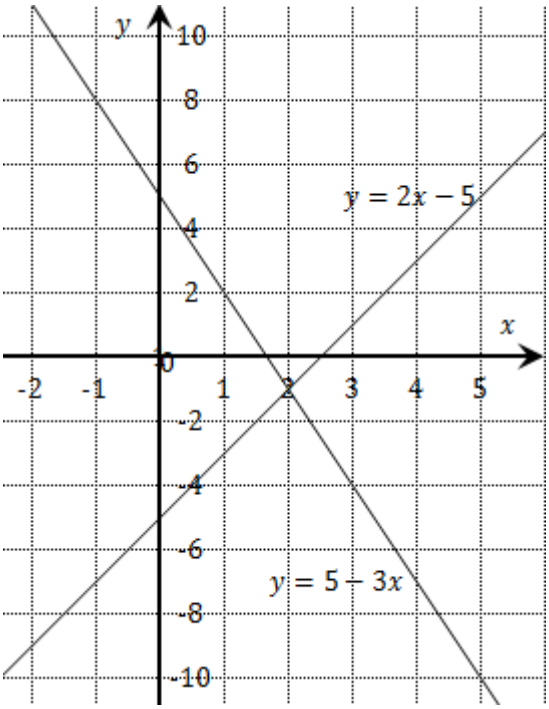
Section B

2011-18.

a.

$y = 5 - 3 \times 2 = 5 - 6 = -1$...Answer

b.



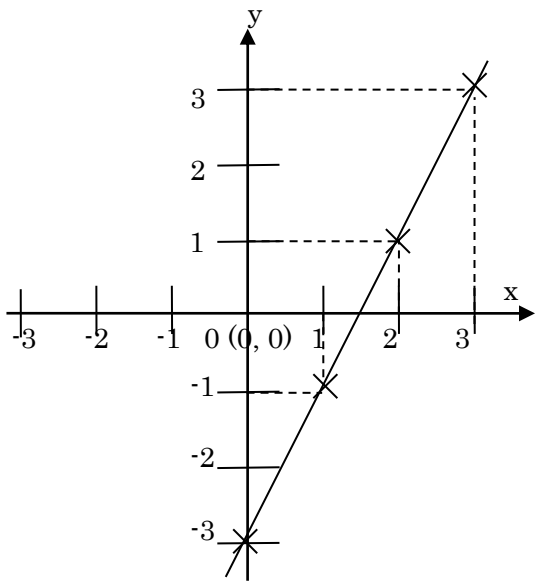
c. $x = 2, y = -1$

2009-16.

a.

x	0	1	2
y	-3	-1	-1

b.



2005-20.

a.

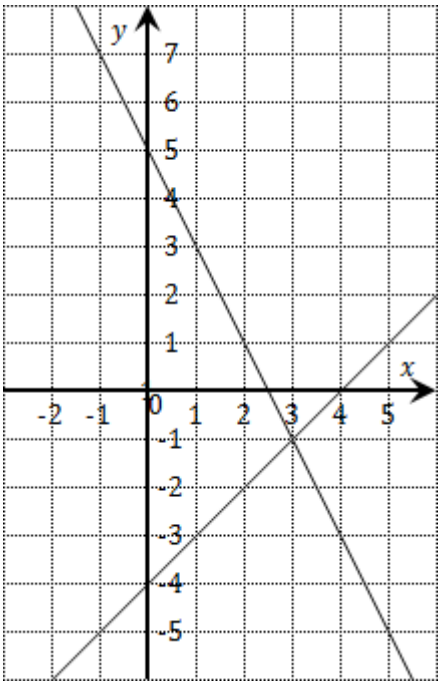
$y = 5 - 2x$

x	-1	2	5
y	7	1	-5

$y = x - 4$

x	-1	2	5
y	-5	-2	1

b.



c.

On the graph, the line $y = 5 - 2x$ and $y = x - 4$ meet at the point (3,-1).

$\therefore x = 3$ and $y = -1$...Answer

16 Travel graph

Section A

2012-4.

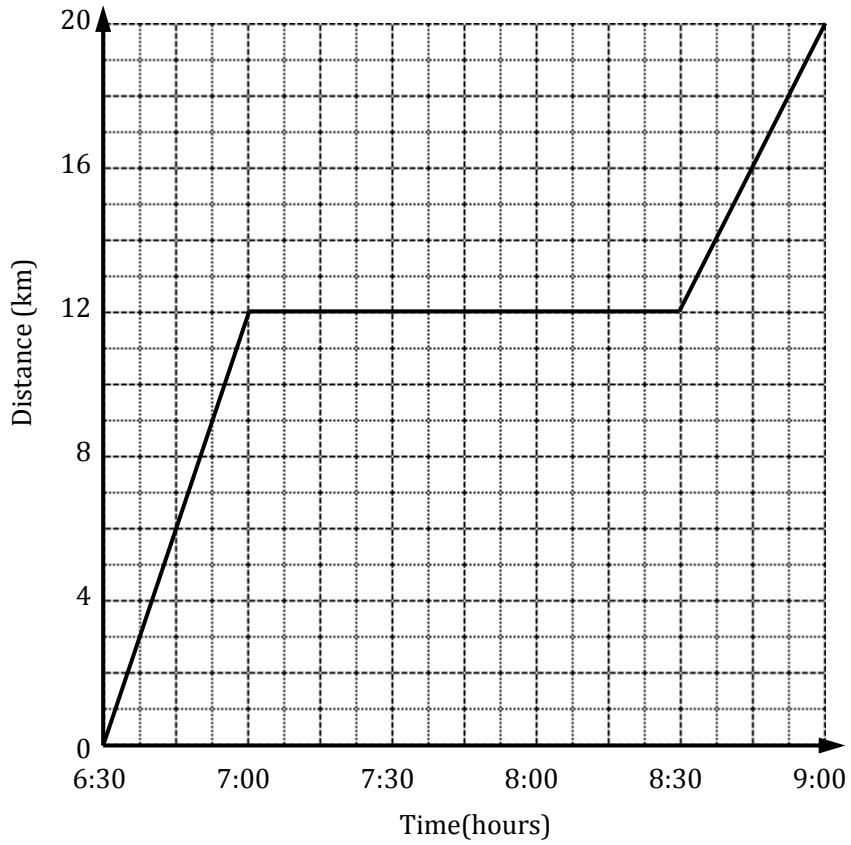
10 litres = 70 km

7 litres = 70 km $\times \frac{7}{10}$ = 49 km ... Answer

Section B

2010-16.

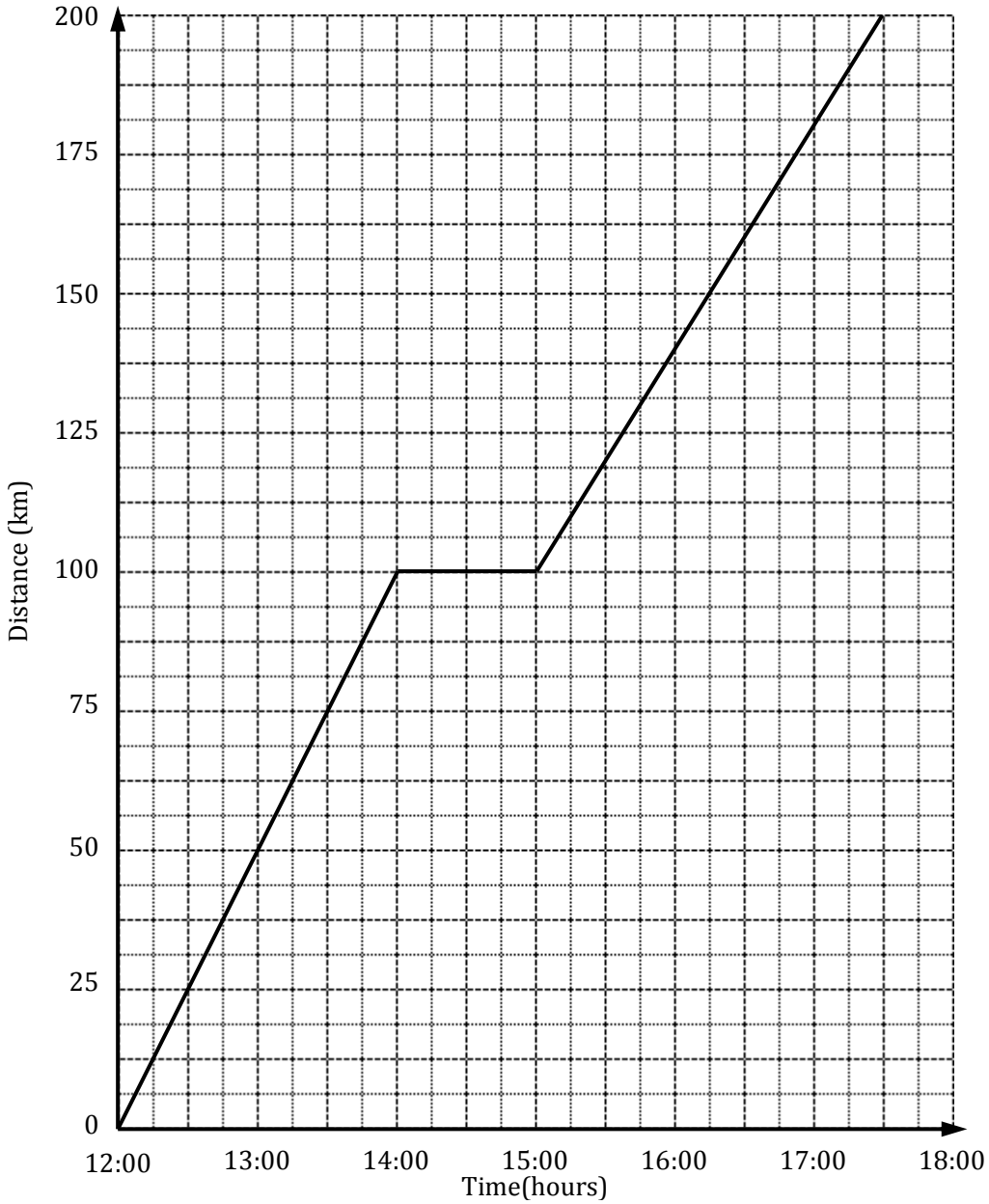
a.



b. 2.5hours

2008-20.

a.



b.

First find the speed after breakdown to arriving.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{200 - 100}{17{:}30 - 15{:}00} = \frac{100}{2.5} = 40km/h$$

Subtract breakdown time from arriving.

16:54 – 15:00 = 1:54 (1 hour and 54 minutes)

So distance is $40\ km/h \times \left(1 + \frac{54}{60}\right) h = 40 \times \frac{114}{60} = 76km$

Therefore, 100 km + 76 km = 176km…Answer

c.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{200 - 100}{17{:}30 - 15{:}00} = \frac{100}{2{:}30} = \frac{100}{2.5} = 40km/h \ldots \text{Answer}$$

2007-17.

a.

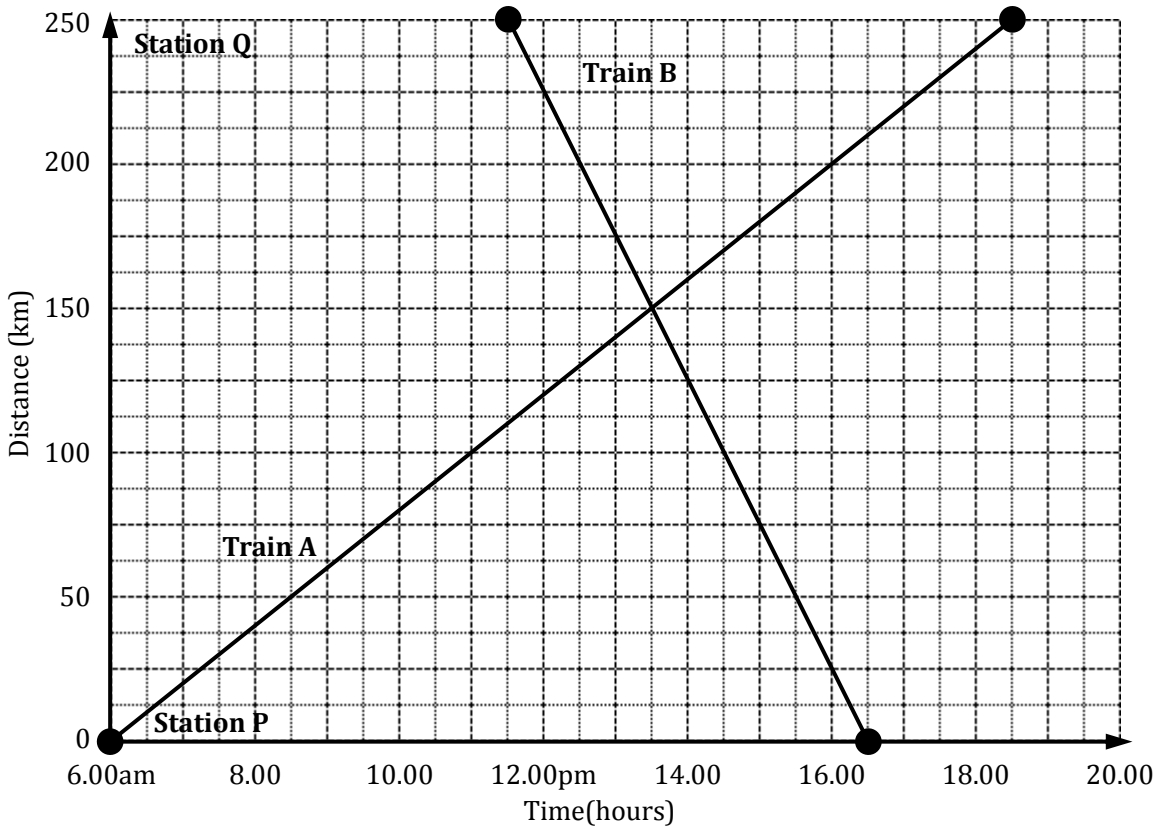
(i) 60km

(ii)

$$\frac{\text{Distance from C to D}}{\text{Time 11.30am to 14.30pm}} = \frac{60\text{km}}{3\text{ hours}} = 20\text{km/h} \ldots \text{Answer}$$

2006-20.

a.



b. 13.30pm

2004-19.

a.

(i) 300km

(ii) 30minutes

2003-20.

The speed of the car $= \frac{60\text{km}}{1.5\text{hour}} = 40\,\text{km/h}$

The speed of the bus $= \frac{60\text{km}}{2\text{hour}} = 30\,\text{km/h}$

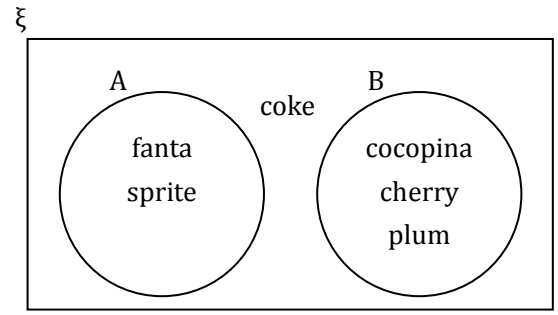
The difference $= 40 - 30 = 10\,\text{km/h}$...Answer

17 Sets

Section A

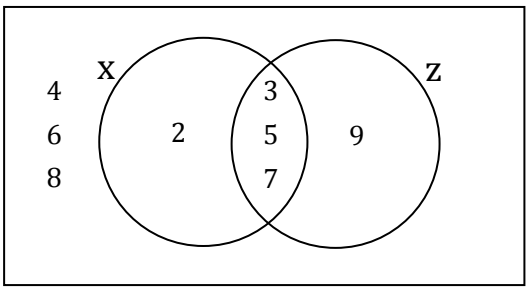
2011-11.

a.



b. $A \cap B = \Phi$

2010-9.



2009-4.

a.

(i) D = {Maize, Cassava, Soya, Rice, Sweet potato, Sorghum, Millet}

the number of crops grown on farm D

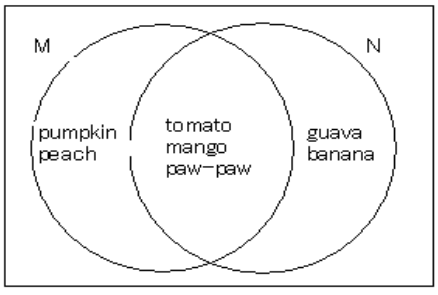
= 7…Answer

(ii) R∩D = {Maize, Cassava, Soya}

crops grown on both farm

= Maize, Cassava, Soya…Answer

2008-3.



2007-5.

$A \cap B = \{2,4,6\}$

2006-10.

$\{3\}, \{4\}, \{3,4\}, \Phi$…Answer

(write only three subsets)

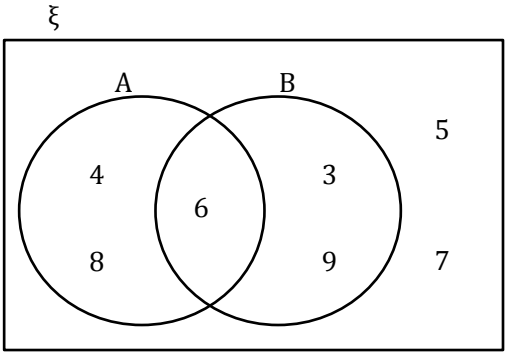
2005-8.

$X \cup Y$

$= \{njiwa, pumbwa, kakowa, khwangwala, nkhunda, timba, kabawi, kadzidzi\}$

The number of elements is 8 …Answer

2004-10.



2003-13.

a.

(i) $P = \{a, b, d, j, m\}$

(ii) $P \cap Q = \{b, m\}$

Section B

2012-18.

b.

(i) $P \cap Q = \{2, 4, 6\}$

(ii) $P \cup Q = \{1, 2, 3, 4, 5, 6, 7, 8\}$

18 Vectors

Section A

2009-11.

$\overrightarrow{CD} = -3\overrightarrow{AB} = -3 \times \begin{pmatrix} -4 \\ 2 \end{pmatrix}$

$= \begin{pmatrix} -3 \times (-4) \\ -3 \times 2 \end{pmatrix} = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$ ... Answer

2008-8.

$\overrightarrow{PQ} = \overrightarrow{PR} + \overrightarrow{RQ}$

$\begin{pmatrix} 6 \\ 5 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

$\begin{pmatrix} 6 = x + 1 \\ 5 = y + 3 \end{pmatrix} = \begin{pmatrix} x + 1 = 6 \\ y + 3 = 5 \end{pmatrix} = \begin{pmatrix} x = 6 - 1 = 5 \\ y = 5 - 3 = 2 \end{pmatrix}$

$\overrightarrow{PR} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ ... Answer

2006-9.

(i) $\overrightarrow{AB}$

$\overrightarrow{AB} = B - A$

$= (5, -2) - (2, 3) = (3, -5)$...Answer

(ii) $\overrightarrow{BA}$

$\overrightarrow{\mathrm{BA}} = \mathrm{A} - \mathrm{B} = (2, 3) - (5, -2)$

$= (-3,5)$...Answer

$\therefore \overrightarrow{\mathrm{AB}} - \overrightarrow{\mathrm{BA}} = (3, -5) - (-3,5)$

$= (6, -10) = 2\overrightarrow{\mathrm{AB}}$

2005-7.

a. $H\begin{pmatrix} 1 \\ -2 \end{pmatrix}, K\begin{pmatrix} 3 \\ 3 \end{pmatrix}$

b. $\overrightarrow{HK} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} - \begin{pmatrix} 1 \\ -2 \end{pmatrix} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

2003-9.

$\frac{1}{2}(\overrightarrow{AB} + \overrightarrow{DC}) = \frac{1}{2}\left[\begin{pmatrix} 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix}\right]$

$= \frac{1}{2}\begin{pmatrix} 4 \\ 8 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ ... Answer

Section B

2012-18.

a.

$\underline{a} - 3\underline{b} = \begin{pmatrix} 2 \\ -3 \end{pmatrix} - 3\begin{pmatrix} -1 \\ 2 \end{pmatrix}$

$= \begin{pmatrix} 2 \\ -3 \end{pmatrix} - \begin{pmatrix} -3 \\ 6 \end{pmatrix} = \begin{pmatrix} 2 + 3 \\ -3 - 6 \end{pmatrix}$

$= \begin{pmatrix} 5 \\ -9 \end{pmatrix}$ ... Answer

2011-19.

b.

$\begin{pmatrix} a \\ 10 \end{pmatrix} = 2\begin{pmatrix} -4 \\ 5 \end{pmatrix} = \begin{pmatrix} -8 \\ 10 \end{pmatrix}$

$\therefore a = -8$...Answer

2010-18.

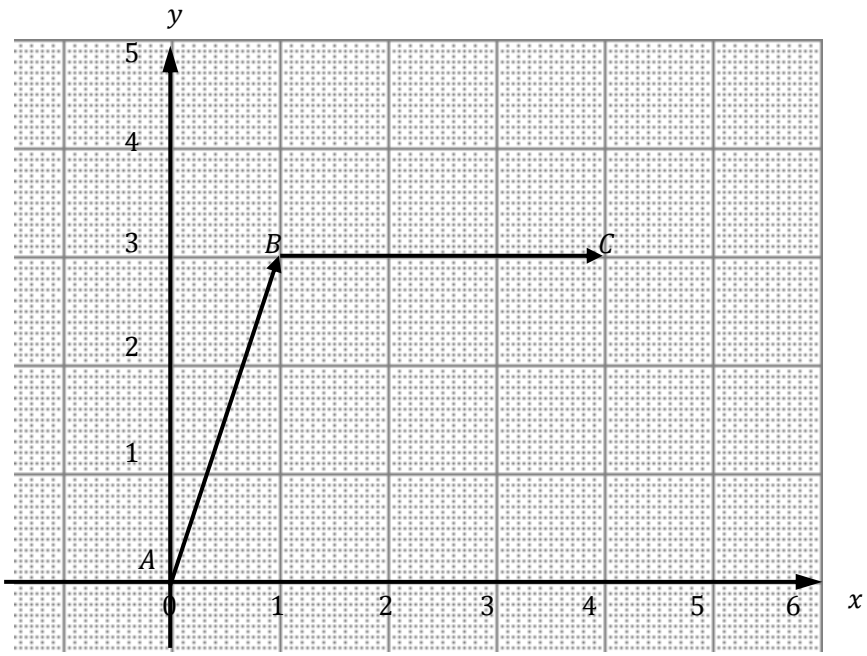
a.

$\overrightarrow{KL} + \overrightarrow{LM} = \begin{pmatrix} 2 \\ 6 \end{pmatrix} + \begin{pmatrix} 2 \\ 0 \end{pmatrix}$

$= \begin{pmatrix} 2 + 2 \\ 6 + 0 \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$ ... Answer

2007-19.

b.



2004-19.

b.

$\vec{a} - \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \end{pmatrix} - \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 2-(-3) \\ 4-1 \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$

$\vec{b} + \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 2 \\ -2 \end{pmatrix} + \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 2+3 \\ -2+5 \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$

$\therefore \vec{a} - \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \vec{b} + \begin{pmatrix} 3 \\ 5 \end{pmatrix}$

19 Line and angles

Section A

2012-7.

$\angle ABH + \angle GHB = 180°$

(allied angles, AB ∥ GH)

$\angle ABH + 125° = 180°$

$\angle ABH = 180° - 125° = 55°$

$\angle ABH + \angle DBE = \angle BEF$

(alternate angles, AC ∥ DF)

$\angle DBE + 55° = 105°$

$\angle DBE = 105° - 55°$

$\angle DBE = 50°$…Answer

2010-2.

$5y° = 130°$

$\therefore y° = 26°$…Answer

2008-5.

n + 62° = 147° (alternate angle)

n = 147° − 62° = 85°…Answer

m = 180° − 62° = 118°…Answer

(alternate angle or corresponding angle)

2007-1.

$x = 180° - 80°$

$= 100°$ (straight line) …Answer

2006-8.

$\angle DEF = 180° - 110° = 70°$ (straight line)

$\therefore u = 70°$

(CD ∥ EF, alternate ∠s are equal)

$\angle BID = 180° - 140°$

$= 40°$ (straight line)

$\therefore \angle IDC = 40°$ (AB ∥ CD, alternate ∠s are equal)

$\therefore w = 180° - u - \angle IDC = 180° - 70° - 40°$

$= 70°$ (straight line)

$\therefore u = 70°, w = 70°$…Answer

2003-8.

$\angle ABF = \angle ACE$ (corresponding angles)

$78° = 2x$

$x = 39°$

$\angle ACD = 2x + x = 3x = 3 \times 39°$

$= 117°$…Answer

Section B

2005-19.

a.

(i)

$\angle ABH + \angle HBK + \angle KBC = 180°$(straight line)

$54° + x° + 2x° = 180°$

$x° = 42°$

$x = 42$…Answer

(ii)

$\angle KBC = 2x = 2 \times 42° = 84°$

$\angle KBC = \angle PCB$

Since alternate angles are equal, BK ∥ PC.

20 Reflection and rotations

Section A

2010-15.

a. omitted (same as the figure in the question)

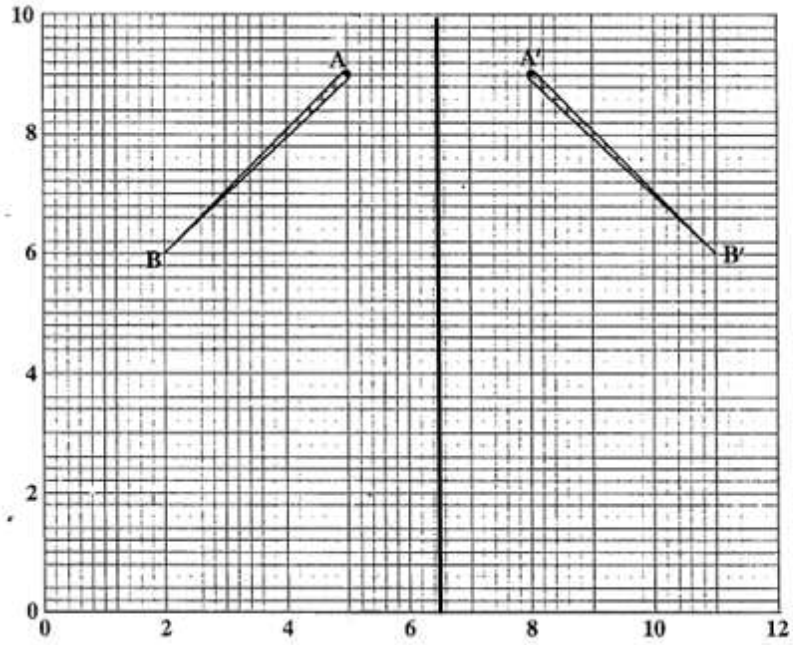
b.

$CA = CA'$ and $CB = CB'$

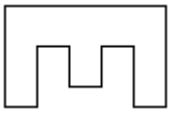
$\therefore$ Centre of rotation is $(4, 0)$...Answer

2006-13.

a. b.



2005-11.

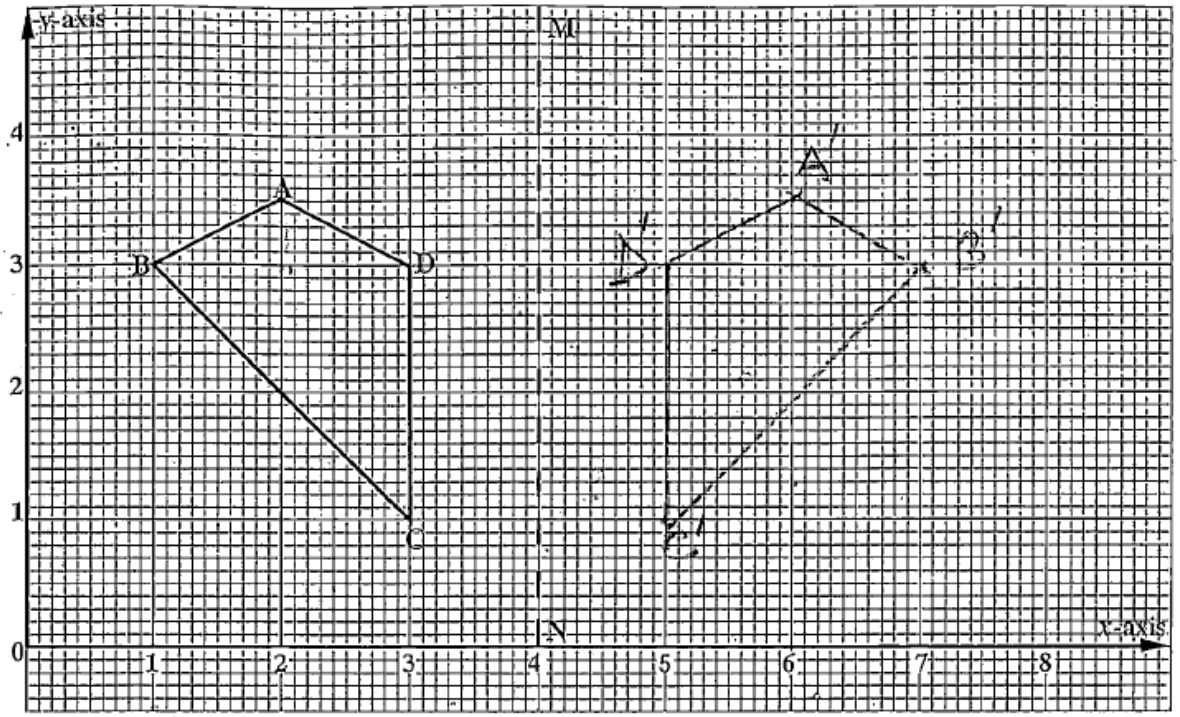


2004-15.

(1,0)

Section B

2012-19.

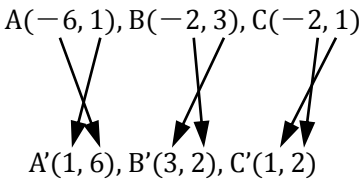


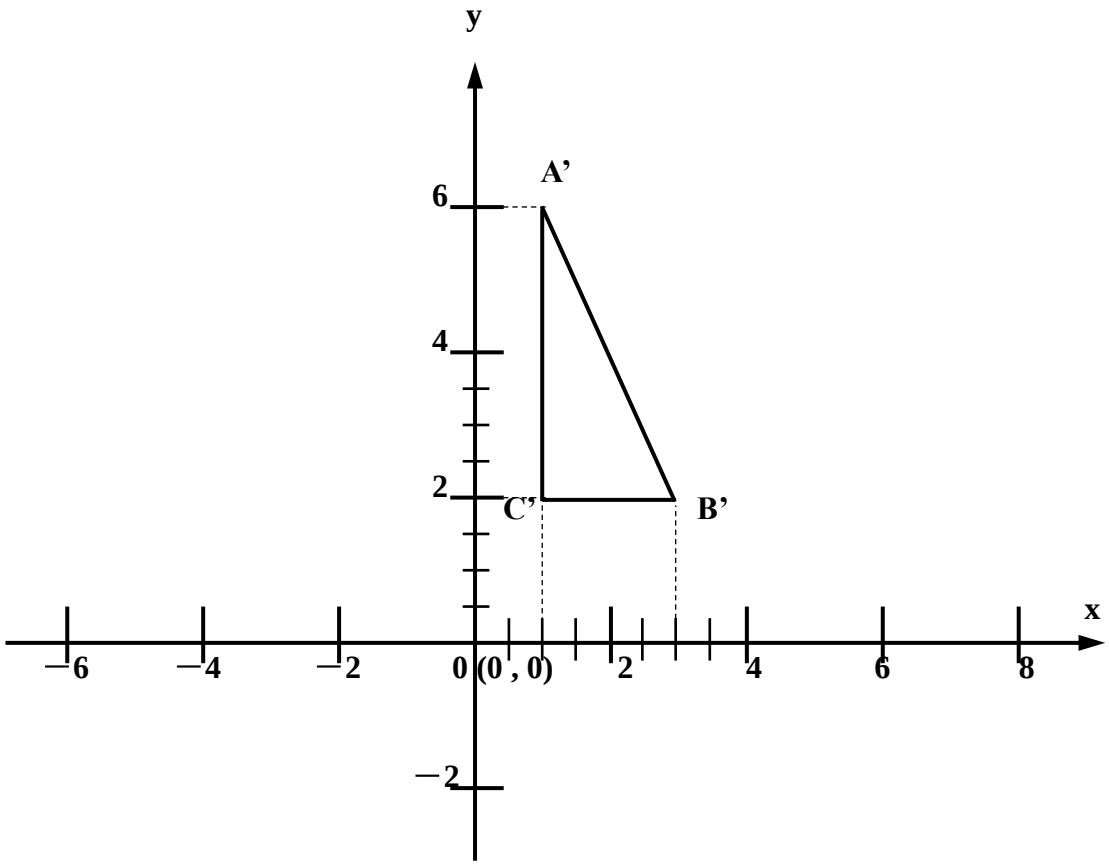
2009-18.

a.

(i) omitted (same as the figure in the question)

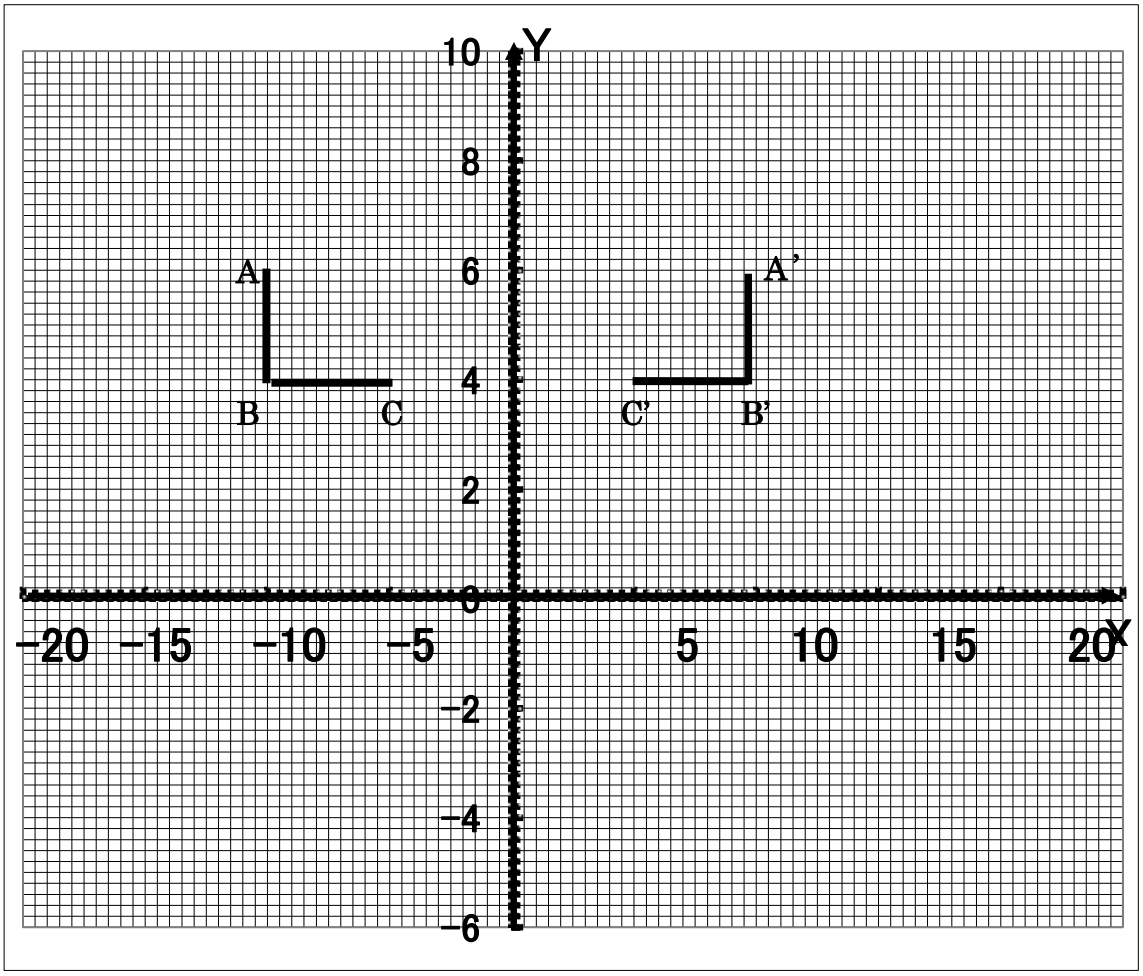
(ii)





2008-16.

a. b.



c. (5,4)

21 Triangles

Section A

2011-12.

SN = RN (given)

PS = QR (PQRS is a rectangle)

∠PSN = ∠QRN = 90°(PQRS is a rectangle)

∴ Triangle PSN ≡ Triangle QRN(S. A. S)

2011-13.

∠PQU = ∠QRS = 68°

(UQ ∥ SR, corresponding angles are equal)

∠QRT = 68° − 18° = 50°

∠QRT = ∠QTR = 50° (the base angles of isosceles triangle QTR are equal)

∠QTV + ∠QTR = 180° (angle on a straight line)

∴ ∠QTV = 180° − ∠QTR = 180° − 50°

= 130°...Answer

2009-12.

$\angle x$ + ∠CBF = 180° (supplementary angles)

∴ $\angle x$ + 92° = 180°

$\angle x$ = 180° − 92° = 88°

∠BEF = ∠ABE (alternate angles)

∴ ∠BEF = 35°

$\angle y + \angle x + \angle BEF = 180°$

(the angle sum of a triangle = 180°)

$\angle y$ + 88° + 35° = 180°

(substituted $\angle x$ = 88° and ∠BEF = 35°)

$\angle y$ = 180° − 88° − 35° = 57°

∴ $\angle x$ = 88°, $\angle y$ = 57°...Answer

2009-14.

b.

In △ WME and △ XLW,

∠WME = ∠XLW = 90°

(EM and XL are perpendicular to WN)

∠EWM = ∠WXL (given angle)

WE = XW (sides of a square are equal)

∴△ WME ≡ △ XLW(A.A.S)

2007-14.

b. In triangle PSR and triangle QRT,

SR = RT (given)

PS = QR (PQRS is a parallelogram)

∠PSR = ∠QRT

(PS ∥ QR, corresponding angles are equal)

∴ triangle PSR ≡ triangle QRT(S. A. S)

2004-1.

$\angle R + \angle P + \angle Q = 180°$

$\angle R$ + 65° + 50° = 180°

$\angle R$ = 65°...Answer

Section B

2006-17.

a. ∠KLS = ∠LSM = 30°

(LK ∥ MS, altermate ∠s are equal)

∠LSM = ∠SLM = 30°

(base angles of isosceles triangles)

∴ ∠LMS = 180° − 30° − 30° = 120°

∴ ∠KMS = 120° − 70°

= 50°...Answer

b. Acute angled triangle

2005-16.

Let angle NDC = x,

then angle NCD = x(triangle NDC is isosceles)

70° + x + x = 180°

x = 55°

∠ADN = ∠ADC − ∠NDC

= 90° − 55° = 35°...Answer

2003-18.

a. In triangles LMQ and MNP,

QL = PM (given side)

LM = MN (given side)

∠QLM = ∠PMN = 90° (given angle)

∴ triangle LMQ ≡ triangle MNP(S.A.S)

22 Convex polygons

Section A

2011-6.

$180°(\text{n} - 2) = 1440°$

$\frac{180\ (\text{n} - 2)}{180} = \frac{1440}{180}$

$\text{n} - 2 = 8$

$\text{n} = 10$

There are 10 sides in this polygon.

$\therefore \frac{1440°}{10} = 144°$ is one interior angle.

$180° - 144° = 36°$

The size of each exterior angle of the polygon is 36° … Answer

2010-7.

b.

Sum of the interior angles of an *n*-sided polygon

$= 180° \times (n - 2)$

$\therefore 180 \times (n - 2) = 1980$

$\frac{180 \times (n - 2)}{180} = \frac{1980}{180}$

$n - 2 = 11$

$n = 13$...Answer

2007-12.

Let the number of sides of the polygon be *n.*

Sum of the interior angles of a *n*-sided polygon= $180° \times (n - 2)$

$180° \times (n - 2) = 2340°$

$n - 2 = 13$

$n = 15$

$\therefore$ The number of sides of the polygon is 15.

The interior angle of the polygon $= \frac{2340°}{15}$

$= 156°$

$\therefore$ The exterior angle of the polygon

$= 180° - 156° = 24°$...Answer

2006-15.

Let the number of sides of the polygon be *n.*

Sum of the interior angles of a *n*-sided polygon= $180° \times (n - 2)$

$180° \times (n - 2) = 1620°$

$n - 2 = 9$

$n = 11$...Answer

2005-14.

The exterior angle is $180° - 168° = 12°$

The sum of the exterior angle of a polygon is always 360°.

$360° \div 12° = 30$

The number of sides $= 30$...Answer

2004-13.

The sum of the interior angles in an n-sided polygon $= 180° \times (n - 2)$

$\therefore$ the sum of the interior angles

$= 180° \times (21 - 2) = 3420°$...Answer

2003-4.

$\angle ABC + \angle BCD + \angle BAD + \angle ADC = 360°$

$96° + 105° + 73° + \angle ADC = 360°$

$\angle ADC = 86°$...Answer

Section B

2012-16.

$3\text{y}° + 100° + 114° + \text{y}° + 126°$

$= 540°$ (angle sum of a pentagon)

$3\text{y}° + \text{y}° + 100° + 114° + 126° = 540°$

$4\text{y}° + 340° = 540°$

$4\text{y}° = 540° - 340°$

$4\text{y}° = 200°$

$\text{y}° = 50°$...Answer

2008-17.

a.

CDEF is a quadrilateral. The sum of interior angles of a quadrilateral is 360°.

$\angle C + \angle D + \angle E + \angle F = 360°$

$\angle C = 85°, \angle D = 115°, \angle E = 120°$

$85° + 115° + 120° + \angle F = 360°$

$320° + \angle F = 360°$

$\angle F = 360° - 320° = 40°$...Answer

b.

ABCDE is a pentagon. The sum of interior angles of a pentagon is 540°.

$\angle C + \angle D + \angle E + \angle EAB + \angle ABC = 540°$

$\angle ABC = 110°$

$85° + 115° + 120° + \angle EAB + \angle ABC = 540°$

$\angle EAB + 430° = 540°$

$\angle EAB = 540° - 430° = 110°$

$\therefore \angle EAB = \angle ABC = 110°$

$\angle FAB = \angle FBA = 180° - 110° = 70°$

Triangle AFB has 2 angles of the same size so it is an isosceles triangle.

2003-18.

b.

Let x be the number of sides.

Then the exterior angle is $\frac{360}{x}$

The interior angle is $180 - \frac{360}{x}$

$180 - \frac{360}{x} = \frac{360}{x} \times 2$

$x = 6$

The number of sides $= 6$ ...Answer

23 Similarity

Section A

2012-13.

b.

In triangle BEA and triangle DFA,

$\angle AFD = \angle BEA$ (given)

$\angle ADF = \angle ABE = 90°$ (ABCD is a square)

$\angle DAF = \angle BAE$

(remaining angles of $\triangle$ BEA and $\triangle$ BCD)

$\therefore$ triangle BEA is similar to triangle DFA

2011-9.

$\triangle$ CED:$\triangle$ AEB = ED: EB = EC: EA

ED: EB = 9: 9 + 6 = 9: 15 = 3: 5

EC: EA = 4: 4 + x

$\therefore$ 3: 5 = 4: 4 + x

$12 + 3x = 20$

$3x = 8$

$x = \frac{8}{3}$ (cm) ... Answer

2010-8.

In triangle AFE and triangle BCD,

$\angle AFE = \angle BCD$ (given)

$\angle AED = \angle BDE = 90°$ (ABDE is a rectangle)

$\therefore \angle AEF = \angle BDC = 90°$

(sum of adjacent angles on a straight line)

$\therefore \angle FAE = \angle CBE$

(remaining angles of ΔAFE and ΔBCD)

$\therefore$Triangle AFE and triangle BCD are similar.

(corresponding angles are equal)

2005-15.

b.

$\triangle DCE \sim \triangle NCM$

$\frac{CD}{CE} = \frac{CN}{CM}$

$\frac{10}{12} = \frac{CN}{30}$

$CN = 25$cm...Answer

2004-12.

triangle PQT ~ triangle PRS

$\frac{PT}{QT} = \frac{PS}{RS}$

$\frac{3}{4} = \frac{PS}{6}$

$PS = \frac{18}{4} = \frac{9}{2} = 4.5$cm ... Answer

Section B

2008-18.

b. Triangle ABC is similar to triangle BDC.

Therefore

$\frac{AB}{BD} = \frac{BC}{DC}$

$\frac{AB}{9} = \frac{10\text{cm}}{6\text{cm}}$

$AB = \frac{10}{6} \times 9 = 15$cm ... Answer

2007-19.

a. scale factor $= \frac{ZY}{AB} = \frac{15}{3} = 5$

ZX = scale factor × AC

$= 5 \times 7 = 35$cm...Answer

2003-19.

a. (i)

In triangles CAB and CBD,

$\angle CAB = \angle CBD$(given angle)

$\angle ACB = \angle BCD$(common angle)

Two angles are respectively equal.

$\therefore$ Triangles CAB and CBD are similar.

(ii) Calculate, the length of CD. (6 marks)

$\frac{AB}{CB} = \frac{BD}{CD}$

$\frac{8}{7} = \frac{6}{CD}$

$CD = \frac{21}{4} = 5.25$cm ... Answer

24 Pythagoras theorem

Section A

2011-15.

$(d + 4)^2 = d^2 + 8^2$

$d^2 + 8d + 16 = d^2 + 64$

$8d = 48$

$d = 6$...Answer

2003-11.

$3^2 + BC^2 = 7^2$

$BC^2 = 40$

$BC = \sqrt{40} = 2\sqrt{10} = 2 \times 3.162$

$= 6.324 \approx 6.3$ (2 s. f.)...Answer

Section B

2009-17.

a.

$FC = DB$

(opposite sides of a parallelogram are equal)

$\therefore FC = 5$cm

$AF = AC - FC$

$\therefore AF = 10 - 5 = 5$cm

Δ AEF is a right angled triangle, so

$AE^2 + EF^2 = AF^2$ (pythagoras'theorem)

$AE^2 + 3^2 = 5^2$

(substituted $EF = 3$ and $AF = 5$)

$AE^2 + 9 = 25$

$AE^2 = 25 - 9$

$AE^2 = 16$

$AE = 4$cm...Answer

2007-18.

b.

$XY^2 + YZ^2 = 3^2 + 4^2$

$= 9 + 16 = 25 = 5^2$

$= XZ^2$

$\therefore$ The triangle XYZ is right angled.

25 Quadrilaterals

Section A

2012-9.

$(2x + 30)° = (7x - 25)°$

$2x - 7x = -25 - 30$

$-5x = -55$

$x = 11$

$\therefore \angle \text{RUT} = (2x + 30)°$

$= (2 \times 11 + 30)° = (22 + 30)°$

$= 52°$...Answer

2005-12.

$\angle$HRJ = $\angle$HJR (Isosceles triangle)

$\angle$HJR = $\angle$GKR (given angle)

$\therefore \angle$HRJ = $\angle$GKR

Since the corresponding angles are equal,

GK ∥ HR.

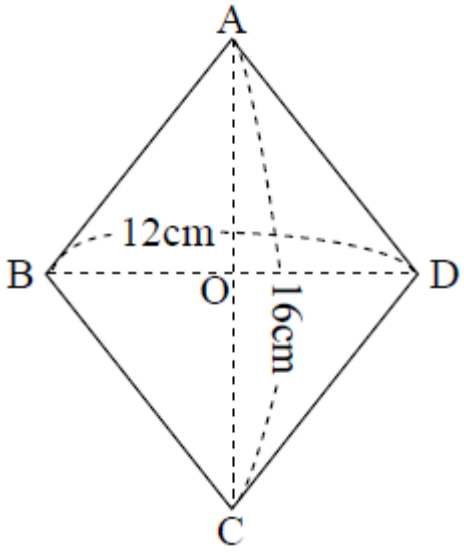
Since GH ∥ KJ, GH ∥ KJ.

$\therefore$ GHRK is a parallelogram.

Section B

2010-20.

b.



Area of rhombus $=\triangle$ ABD $+\triangle$ CBD

$= 12 \times 8 \times \frac{1}{2} + 12 \times 8 \times \frac{1}{2}$

$= 48 + 48 = 96\text{cm}^2$...Answer

2008-19.

b.

WXYZ is a parallelogram so opposite angles are equal.

$(a^2 - 2a) = 63$

$a^2 - 2a = 63$

$a^2 - 2a - 63 = 0$

$(a - 9)(a + 7) = 0$

$a = 9, -7$

2004-20.

b.

In the rhombus ABCD,

let AC = 10cm and BD = 24cm.

Let E be the point where the diagonals meet.

Then AE = CE = 5cm, BE = DE = 12cm

In triangle AEB, use the Pythagorean theorem:

$\text{AB}^2 = \text{AE}^2 + \text{BE}^2$

$\text{AB}^2 = 5^2 + 12^2 = 169$

AB = 13

The length of a side is 13cm ...Answer

26 Mensuration

Section A

2007-14.

a.

Volume $= \pi r^2 h = \frac{22}{7} \times 7^2 \times 10$

$= 1540\text{cm}^3$ ...Answer

2003-10.

The base area $= 7 \times 7 \times \left(\frac{22}{7}\right) = 154\text{cm}^2$

The volume = the base area × the height

$= 154 \times 10 = 1540\text{cm}^3$ ...Answer

Section B

2009-19.

(the total surface area of a cylinder)

= (curved surface area) + (area of two circles)

$\therefore (2\pi r \times h) + (2 \times \pi r^2)$

$$= \left(2 \times \frac{22}{7} \times \frac{7}{2} \times 20\right) + \left\{2 \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2\right\}$$

$= 440 + 77$

$= 517\ \text{cm}^2$ ...Answer

2004-16.

Area of base $= 8 \times 6 = 48\text{cm}^2$

Area of triangle VAB $= 8 \times 14 \div 2 = 56\text{cm}^2$

Area of triangle VBC $= 6 \times 12 \div 2 = 36\text{cm}^2$

Area of lateral face $= 56 \times 2 + 36 \times 2$

$= 184\text{cm}^2$

The total surface area $= 48 + 184$

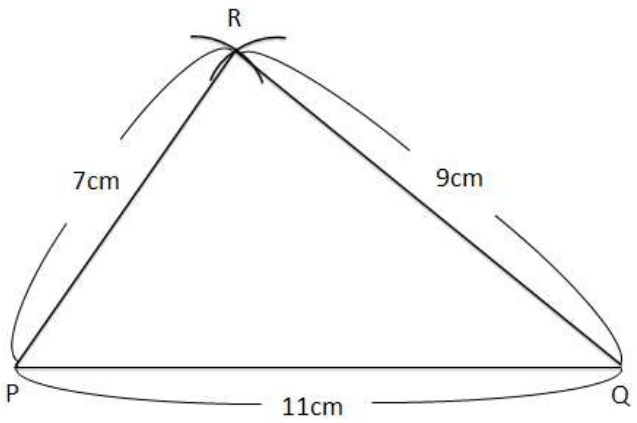
$= 232\text{cm}^2$ ... Answer

27 Geometrical constructions

Section A

2007-15.

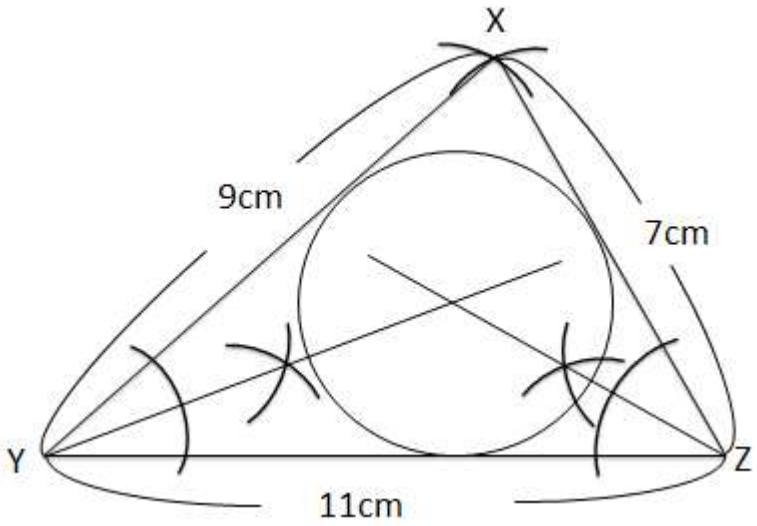
a.



Section B

2012-20.

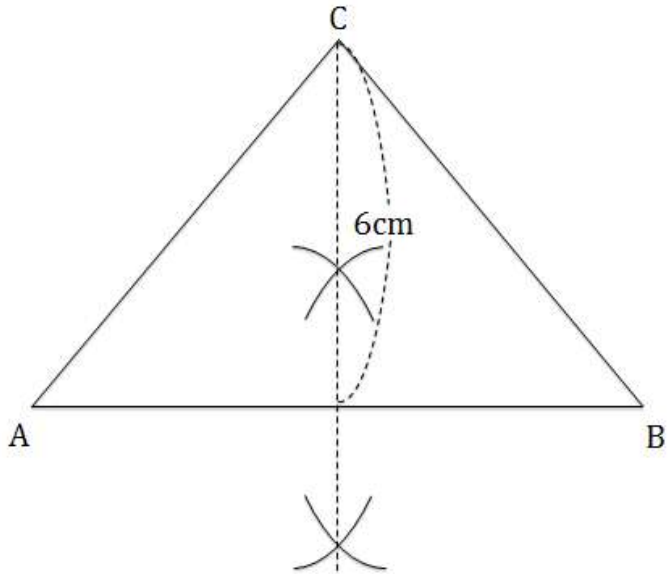
a.



b. 2.3cm

2011-20.

(i)(ii)



(iii) $\angle BAC = 50°$

2010-19.

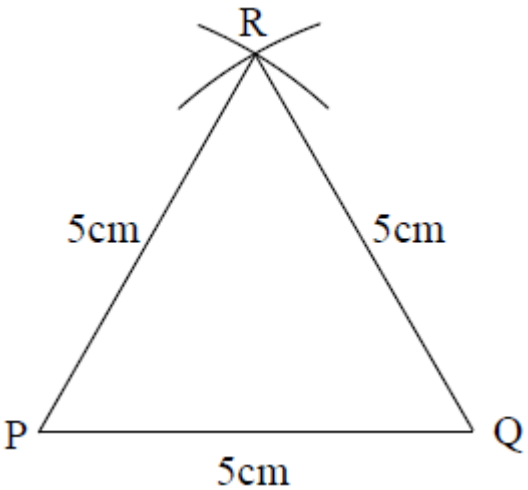
a. (i)

Step1. Using a ruler, draw a line of 5cm. Label the ends, P and Q.

Step2. Set the compasses to the second length, 5cm. Place the point of the compasses at P and draw an arc.

Step3. Set the compasses to the third length, 5cm. Place the point of the compasses at Q and draw another arc. Label the intersection, R.

Step4. Join P and Q to the intersection R.



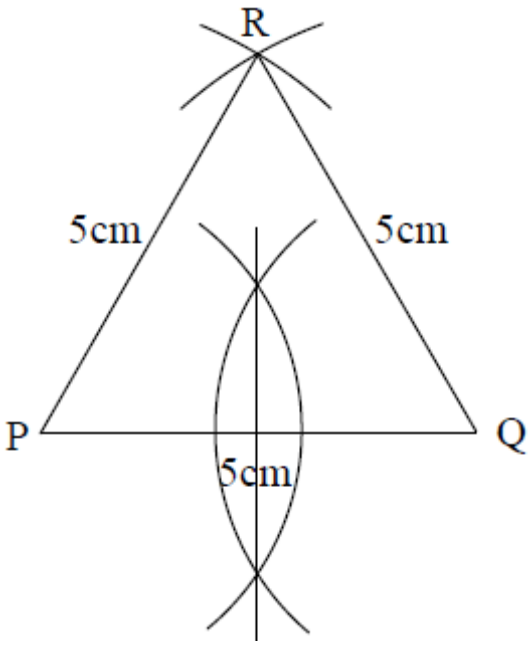
2010-19.

a. (ii)

Step1. Set the compasses to slightly more than half the length of the side PQ. Place the point at P and draw an arc.

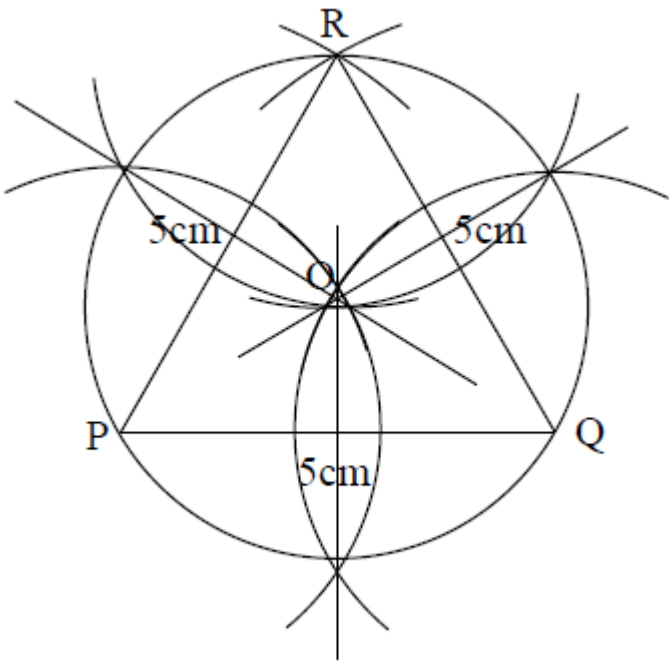
Step2. Without changing the setting of the compasses, place the point at Q and draw another arc.

Step3. Join the intersections of the arcs to find the perpendicular bisector.



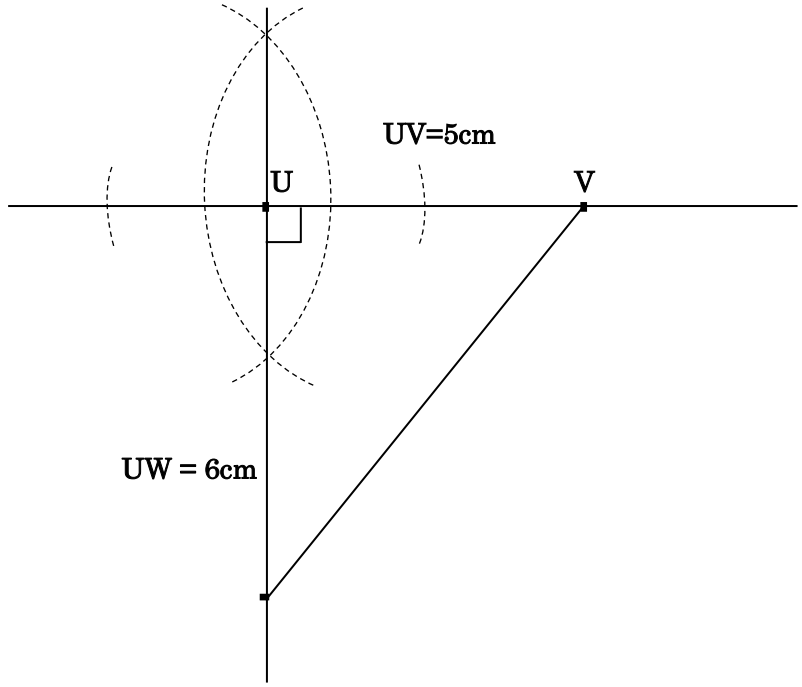
Step4. Do "Step1 to Step3" also about sides PR and QR.The intersection of the three perpendicular bisectors is the centre (O) of the circumscribed circle.

Step5. Set the compasses to the length of OP. Place the point of the compasses at O and draw the circle.

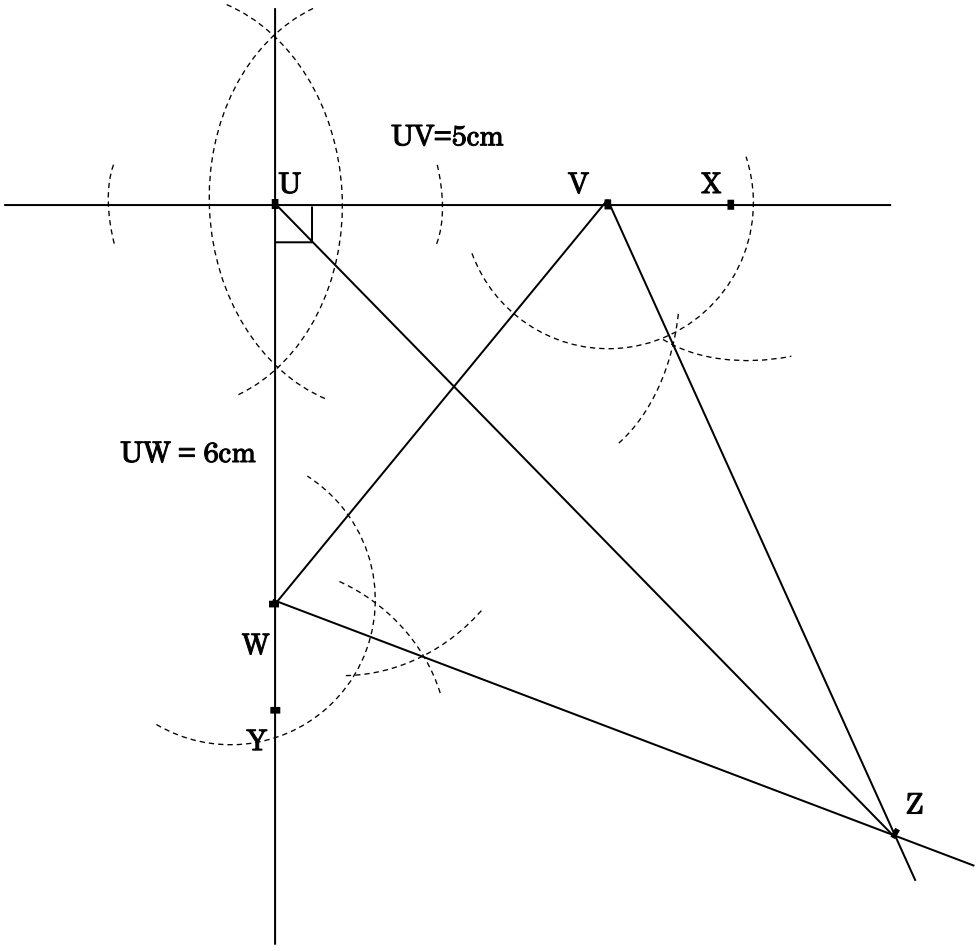


2009-20.

a.



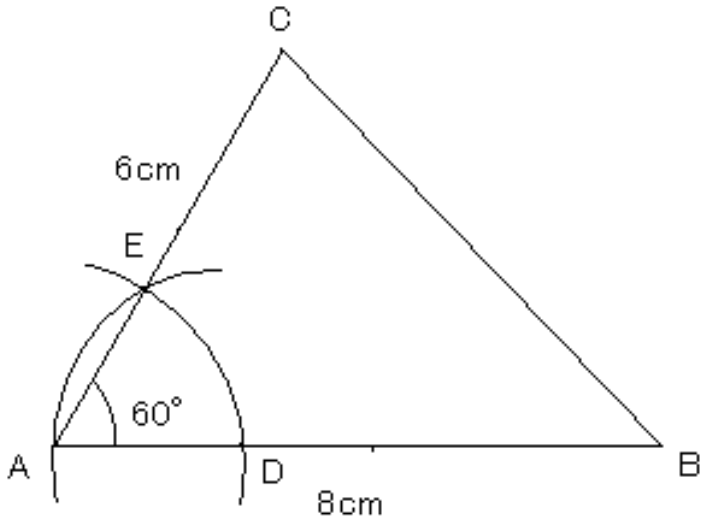
b.



c. UZ=13.3cm

2008-18.

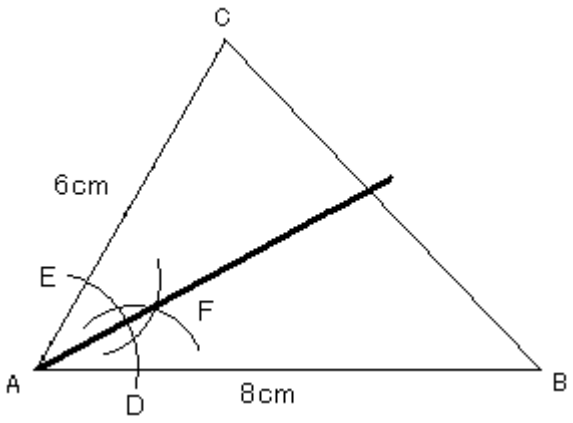
a. (i)



To draw 60° only compass and ruler.

1. Draw a straight line (8 cm long) and mark on point B.
2. With centre A, and draw an arc to cut AB at D.
3. With centre D and the same radius, draw an arc to cut the previous one at E. Join AE.

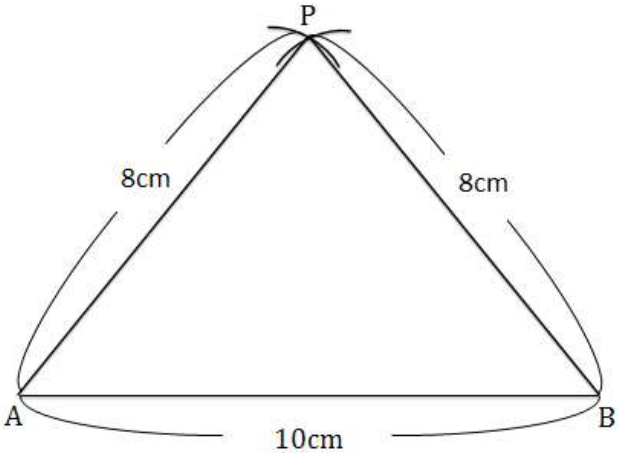
(ii)



1. With centre A, and draw an arc to cut AB at D and AC at E.
2. With centre D, and draw an arc.
3. With centre E, and draw an arc same radius as Step 2.
4. Label the point where the arcs cut F. Join AF. AF is the required line.

2006-19.

a. b.

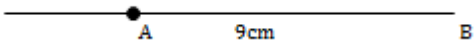


c. $\angle APB = 78°$

2004-20.

a.

Step1. Draw a line of 9cm. Label the ends A and B. Extend the line past A.



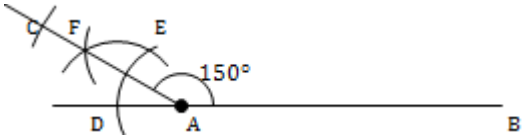
Step2. Open a pair of compasses to about 2cm wide. Place the point of the compasses at A and draw an arc to cut the extended line. Label the intersection D.

Step3. Without changing the radius, place the point at D and draw an arc. Label the intersection with the arc drawn in Step2, E.

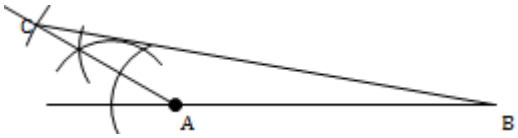
Step4. Without changing the radius, place the point at E and draw an arc. Label the intersection with the arc drawn in Step3, F.

Step5. Draw a line through A and F.

Step6. Open the compasses to 4.5cm wide. Place the point of the compasses at A and draw an arc to cut the line AF. Label the intersection C.



Step7. Join B and C.



$\angle ABC \approx 10°$

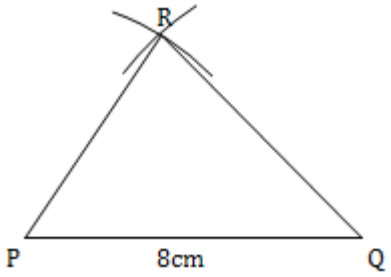
2003-17.

Step1. Draw PQ which is 8cm long.

Step2. Open a pair of compasses to 7cm wide. Place the point of the compasses at Q and draw an arc.

Step3. Open the compasses to 6cm wide. Place the point at P and draw an arc.

Step4. Label the intersection of the two arcs R. Join PR and QR.

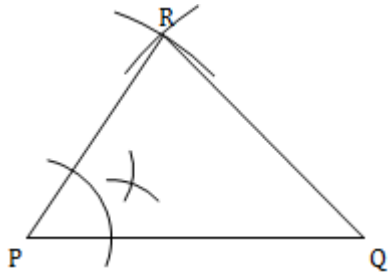


b.

Step1. Place the point of the compasses at P and draw an arc to cut the lines PQ and PR.

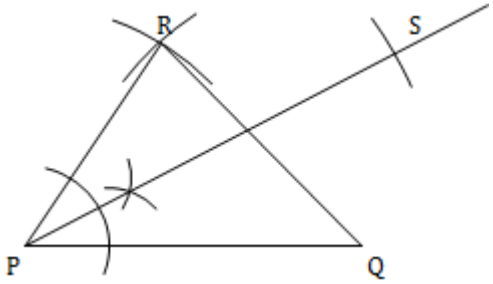
Step2. Place the point at one intersection and draw an arc.

Step3. Without changing the radius, place the point at the other intersection and draw an arc.



Step4. Draw a line through P and the intersection of the arcs drawn in Step2 and 3.

Step5. Open the compasses to 10cm wide. Place the point at P and draw an arc. Label the intersection with the arc, S.



$QS \approx 5\text{cm}$