Level 6 Summer Review

1) Simplify

$-7(6+3)+3v+10v$	$-10(-6-9)+3v+10v$	$10-10(-6-3v)+2v$
$= -63+13v$	$-10(-15)+13v$	$10+60+30v+2v$
$-63+13v$	$13v+150$	$32v+70$

2) Simplify

$-1(-10-3)-5v-9v$	$5-3(1-6v)+4v$	$-2+2(-2-7v)-9v$
$=-(-13)-14v$ $=13-14v$	$=5-3+18v+4v$ $=2+22v$	$-2-4-14v-9v$
$-14v+13$	$22v+2$	$-23v-6$

3) Ron drew a square with each side being exactly 12 centimeters long. If he wanted to make the ~~side of the~~ square 6% larger, what will be the side of the new square?

6% larger $= \frac{6}{100} \times 12 = \frac{72}{100}$

Side (larger sq) $= \frac{72}{100}$ cm $= 0.72$ cm

Side (New Square) $= 12.72$ cm

4) A company was having a sale for 17% off the price of TV's. How much money you would save if you bought 25 monitors originally priced at \$500 each?

S.P (each monitor) $= (100-17)\%$ of 500
$= [(83) \times 500] \div 100$
$= 83 \times 5$
$= 415$

SP of 25 monitors $= 25 \times 415 = \$10,375$

$\$ 12,125$

5) A mall kiosk needed to buy 45 new cell phone cases originally priced at 30 dollars apiece. Because they were buying so many they got 15% off the price. How much did they pay in all?

CP(each case) $= \frac{85}{100} \times 30 = \$25.50$

CP(45 cases) $= \$25.50 \times 45$

$\$ 1147.50$

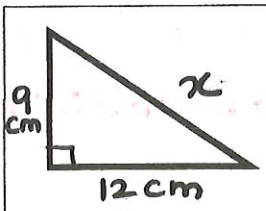
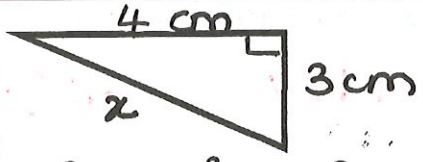
6) Over the spring gas prices dropped 2%. Which expression shows the new price of a gallon of gas? (the old price is represented by p)

New price $= \frac{98}{100} p$

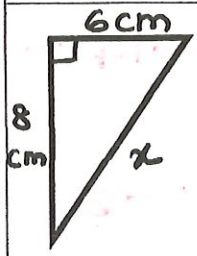
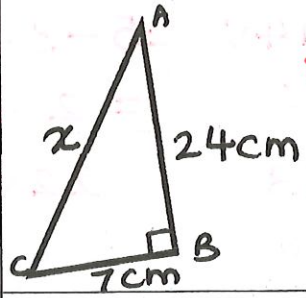
$\left(\frac{49}{50} p\right)$

$a^2+b^2=c^2$

7) Find the unknown side — Pythagorus Theorm

 $x^2 = 81+144$ $x^2 = 225$ $x = \sqrt{225}$	 $x^2 = (4)^2+(3)^2$ $= 16+9 = 25$ $x = \sqrt{25}$
$x =$ 15 cm	$x =$ 5 cm

8)

 $x^2 = 6^2+8^2$ $x^2 = 36+64$ $x^2 = 100$ $x = \sqrt{100}$	 $x^2 = 24^2+7^2$ $x^2 = 576+49$ $x^2 = 625$
$x =$ 10 cm	$x =$ 25 cm

9) Solve

	C1	C2	C3
a)	$x^3 = 64$ $= 4\times4\times4$	$x^2 = 64$ $x = \sqrt{64}$	$x^2 = 100$ $x = \sqrt{100}$
	$x =$ 4	$x = \pm 8$	$x = \pm 10$
b)	$x^3 = -1000$ $x = \sqrt[3]{-1000}$	$x^2 = 1000$ $x = \sqrt{1000}$	$x^3 = 1000$ $x = \sqrt[3]{1000}$
	$x = -10$	$\pm 10\sqrt{10}$	10
c)	$x^3 = -81$ $x = \sqrt[3]{-81}$	$x^2 = 81$ $x = \sqrt{81}$	$x^2 = -81$ $x = \sqrt{-81}$
	$-3 \cdot \sqrt[3]{3}$	$x = \pm 9$	$\sqrt{-81}$

$x = \sqrt[3]{-(3\times3\times3\times3)}$

$x = \sqrt[3]{(-3)(-3)(-3)(3)}$

$x = \sqrt{(-1)(9)(9)}$

10)

a) 8×10^8 is 0.4 times the value of 2×10^9 $\frac{8\times10^8}{2\times10^9} = \frac{4}{10}$

b) 42×10^3 is 0.7 times the value of 6×10^4 $\frac{42\times10^3}{6\times10^4} = \frac{7}{10}$

c) 42×10^8 is 7×10^6 times the value of 6×10^2 $\frac{42\times10^8}{6\times10^2} = 700$

d) 4×10 is 0.1 times the value of 4×10^2 $\frac{4\times10}{4\times10^2} = \frac{1}{10}$

11) Simplify

	C 1	C 2
a)	$(7\times10^4) \times (6\times10^5)$ $= (7\times6)\times(10)^{4+5}$	$(3\times10^1) \times (8\times10)$ $= (3\times8)\times(10)^1\times10^1$
	42×10^9	2400
b)	$(7\times10^{-4}) \times (6\times10^5)$ $= (7\times6)\times(10)^{-4+5}$ $= 42\times10^1$	$(3\times10^{-1}) \times (8\times10)$ $= (3\times8)\times(10)^{-1+1}$ $= 24\times10^0$
	420	24
c)	$(7\times10^4) \times (6\times10^{-5})$ $(7\times6)\times(10)^{4-5} = 42\times10^{-1}$	$(3\times10^{-1}) \times (8\times10^{-1})$ $24\times(10)^{-1-1} = 24\times10^{-2}$
	4.2	0.24

12) 56 meters of cloth is required to make 25 shirts. How much cloth is required to make 35 shirts of the same size?

meters	Shirts
56	25
x	35

Direct

$\frac{56}{25} = \frac{x}{35}$

$x = \frac{56\times\cancel{35}^{7}}{\cancel{25}_{5}}$

$x = \frac{56\times14}{10}$

$= 78.4$

78.4 meters

(Express in scientific notation)

13) Simplify

	C1	C2
a)	$(7.7 \times 10^8) \times (6.9 \times 10^5)$	$(3.2\times10^3) \times (5.8\times10^{10})$
	$(7.7\times6.9)\times10^{8+5}$	$(3.2\times5.8)\times10^{3+10}$
	$= 53.13\times10^{13}$	$= 18.56\times10^{13}$
	5.313×10^{14}	1.856×10^{14}
b)	$(7.7 \times 10^{-8}) \times (6.9 \times 10^5)$	$(3.2\times10^{-3}) \times (5.8\times10^{10})$
	$(7.7\times6.9)\times10^{-8+5}$	$(3.2\times5.8)\times10^{-3+10}$
	$(53.13)\times10^{-3}$	$(3.2\times5.8)\times10^{7}$
	5.313×10^{-2}	1.856×10^{8}
c)	$(7.7 \times 10^8) \times (6.9 \times 10^{-5})$	$(3.2\times10^3) \times (5.8\times10^{-10})$
	$=(7.7\times6.9)\times(10^{8-5})$	$(3.2\times5.8)\times10^{+3-10}$
	$= 53.13\times10^{3}$	$(3.2\times5.8)\times10^{-7}$
	5.313×10^{4}	1.856×10^{-6}

14) A typist takes 1 hour 45 minutes to type 24 pages. How long will he take to type 64 pages?

time	pages
105 min	24
x	64

Direct

$\frac{105}{24} = \frac{x}{64}$

$x = \frac{105\times64}{24} = 35\times8$

280 minutes

15) If $\frac{8}{15}$ of a cargo is worth \$600. What is the cost of $\frac{2}{3}$ of the cargo?

Cargo	cost
8/15	\$600
2/3	x

Direct

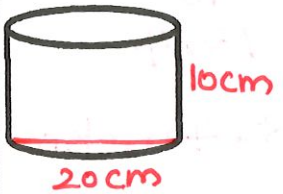
$\left(\frac{8}{15} \div 600\right) = \frac{2}{3} \div x$

$\frac{8}{15\times600} = \frac{2}{3x}$

$x = \frac{15\times600\times2}{8\times3} = 1500$

\$ 750

16) Find the volume of a cylinder whose diameter of the base is 20 cm and the height is also 10 cm $[Volume\ of\ cylinder = \pi R^2 H \text{ and } \pi = 3.14]$



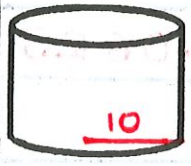
Volume $= \pi R^2 H$

$= 3.14\times10\times10\times10$

$= 3140$

3140 cm^3

17) Find the volume of a cylinder whose radius of the base is 10 cm and the height is 15 cm [$Volume\ of\ cylinder = \pi R^2 H$ and $\pi = 3.14$]



Volume $= \pi R^2 H$
$= 3.14 \times 10 \times 10 \times 15$
$= 314 \times 15$

4710 cm^3

18) What is the volume and the total surface area of a cube with each side length 5 cm

Volume (cube)
$= 5 \times 5 \times 5$
$= 125\ cm^3$

TSA (cube)
$= 6(s)^2$
$= 6 \times 5 \times 5 = 30 \times 5$

Volume	TSA
$125\ cm^3$	$150\ cm^2$

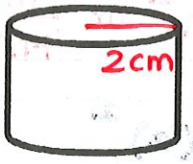
19) What is the volume and the total surface area of a cube with each side length 0.8 cm

Volume $= (s)^3$
$= (0.8)(0.8)(0.8)$
$= 0.512\ cm^3$

TSA (cube) $= 6(s^2)$
$= 6 \times 0.8 \times 0.8$
$= 6 \times 0.64 = 3.84\ cm^2$

Volume	TSA
$0.512\ cm^3$	$3.84\ cm^2$

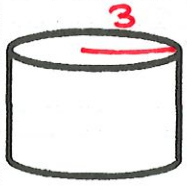
20) Find the volume of a cylinder whose radius of the base is 2 cm and the height is 1 cm [$Volume\ of\ cylinder = \pi R^2 H$ and $\pi = 3.14$]



Volume (cylinder)
$= \pi R^2 H$
$= 3.14 \times 2 \times 2 \times 1$
$= 3.14 \times 4$
$= 12.56$

$12.56\ cm^3$

21) Find the volume of a cylinder whose radius of the base is 3 inches and the height is 8 inches [$Volume\ of\ cylinder = \pi R^2 H$ and $\pi = 3.14$]



Volume (cylinder)
$\pi R^2 H$
$= 3.14 \times 3 \times 3 \times 8$
$= 3.14 \times 72$
$= 226.08$

226.08 $inches^3$

22) Find the value without using a calculator

a)	$0.125 * 0.3$ $125 \times 3 = 375$ 0.0375	$0.125 * 0.5$ $125 \times 5 = 625$ 0.0625
b)	$0.125 * 0.004$ $125 \times 4 = 500$ 0.0005	$0.125 * 2$ $125 \times 2 = 250$ 0.250
c)	$0.125 * 0.04$ $125 \times 4 = 500$ 0.005	$0.125 * 200$ $125 \times 2 = 250$ 25

23) Simplify using Laws of exponents

	C1	C2	C3
a)	$m^3 n^5 \times m^5 n^2$ $m^{3+5} \quad n^{5+2}$ $m^8 \; n^7$	$4x^3 \div 2x$ $\frac{4x^3}{2x} = 2x^{3-1}$ $2x^2$	$(2xy)(3x)^2$ $(2xy)(3x)(3x)$ $18x^3y$ $18x^3y$
b)	$\frac{x^3 y^5 z^5}{xyz}$ $= x^{3-1} \; y^{5-1} \; z^{5-1}$ $x^2 y^4 z^4$	$(14)^p \div (7)^p$ $\left(\frac{14}{7}\right)^p = (2)^p$ $(2)^p$	$\frac{15m^2n^3}{60mn^5}$ $= \frac{1}{4} m^{2-1} \; n^{3-5}$ $\left(\frac{1}{4}\right) m n^{-2}$ or $\frac{m}{4n^2}$
c)	$(100)^{100} \div (25)^{100}$ $\left(\frac{100}{25}\right)^{100} = (4)^{100}$ $(4)^{100}$	$(10)^2 \times \left(\frac{1}{2}\right)^2$ $\left(10 \times \frac{1}{2}\right)^2 = (5)^2$ 25	$(2^0)^3 \div (2)^2$ $(2)^0 \div (2)^2 = \frac{1}{4}$ $= 1 \div 4$ $(1/4)$

24) Find the value of

	C1	C2
a)	$0.2\times10^5 + 3.5\times10^5$ $= (0.2+3.5)\times10^5$ $= (3.7)\times10^5$	$5.2\times10^5 - 3.2\times10^5$ $=(5.2-3.2)\times10^5$ $= 2\times10^5$
	(3.7×10^5)	2×10^5
b)	$6\times10^{-2} + 4\times10^{-2}$ $= (6+4)\times10^{-2} = 10\times10^{-2}$	$6\times10^{-2} - 4\times10^{-2}$ $(6-4)\times10^{-2} = 2\times10^{-2}$
	$=\frac{10}{100} = (1/10)$	$2/100 = 0.02 = 1/50$
c)	$8\times10^3 + 1\times10^3$ $= (8+1)10^3 = 9\times10^3$	$8\times10^3 - 1\times10^3$ $= (8-1)\times10^3$ $= 7\times10^3$
	9,000	7,000

25) Find a number which when increased by 10% becomes 66.

Let the # be x

110% of $x = 66$

$\frac{110}{100}\times x = 66$

$x = \frac{66^{6}\times10\cancel{0}}{11\cancel{0}}$

60

26) Find a number which when increased by 15% becomes 207.

Let the # be x

$\frac{115}{100}\times x = 207$

$x = \frac{207\times100}{115}$ (9, 20, 5)

$x = 180$

Original	Increase
100	115
x	207

180

Simplify using Laws of exponents

27)

	C2	C3
a) $(3)^9 \times (3)^{-6}$ $=(3)^{9-6}=(3)^3$	$-49 \times (7)^{-2}$ $\frac{-49}{(7)^2} = \frac{-49}{49}$	-60×6^{-1} $= \frac{-60}{6} = -10$
27	-1	-10

b)	$(-2)^{-2} \times (3)^{-1}$ $\left(\frac{1}{-2}\right)^2 \times \left(\frac{1}{3}\right)^1$ $= (1/4) \times (1/3)$	$(2)^{-1} \times (3)^{-1} \times (5)^{-2}$ $\frac{1}{2} \times \frac{1}{3} \times \left(\frac{1}{5}\right)^2$	$(2)^{-2} \times (4)^2 \times (2)^{-1}$ $\frac{1}{(2)^2} \times (4)^2 \times \frac{1}{(2)}$ $= 16/8$
	$(1/12)$	$(1/150)$	2

c)	$(50)^{-6} \times (50)^{12}$ $= (50)^{-6+12}$ $= (50)^6$	$(2)^5 \times (2)^{-6} \times (2)^3$ $(2)^{5-6+3}$ $= (2)^2$	$(3)^{-1} \times 9$ $\left(\frac{1}{3} \times 9\right)$ $= 3$
	$(50)^6$	4	3

d)	$(-3)^{-3} \times (2)^{-3}$ $(-3 \times 2)^{-3} = (-6)^{-3}$	$(10)^{-23} \times (10)^{23}$ $(10)^{-23+23}$ $= (10)^0$	$(0.5)^{10} \times (0.5)^{-10}$ $(0.5)^{10-10}$ $= (0.5)^0$
	$(-1/6)^3 = -1/216$	1	1

e)	$(-3n) \times (-3n)$ $(-3 \times -3)\, n^2$	$(5n) \div (2n^{-2})$ $\frac{5n}{2n^{-2}} = \frac{5}{2} n^3$	$4y^2 \times 3y^{-2}$ $(4 \times 3)\, y^{2-2}$ $= 12(y)^0$
	$9n^2$	$(5/2)\, n^3$	12

28) Simplify using Laws of exponents C 2

a)	$(-6a^{-2}) \div (4a^{-4})$	$9b^4 \times 9b^{-8}$
	$\left(\frac{-6}{a^2}\right) \div \left(\frac{4}{a^4}\right) = \frac{-6}{a^2} \times \frac{a^4}{4}$	$\frac{(9b^4) \times 9}{b^8} = \frac{81}{b^4}$
	$\left(-\frac{3}{2}\right) a^2$	$\left(81/b^4\right)$
b)	$-\frac{1}{2}x^3 \times x^4$	$(-1000)^0 \div (3)^0$
	$\left(\frac{-1}{2}\right) x^{3+4} = \left(\frac{-1}{2}\right) x^7$	$1 \div 1$
	$(-1/2)\, x^7$	1
c)	$z^2 \times 3(z)^{-3} \div (6) z^{-2}$	$(-3)^{100} \times \frac{-5}{(6)^{100}} \times (-2)^{100}$
	$\left(z^2 \times \frac{3}{z^3} \div \frac{6}{z^2}\right) = \frac{3}{z} \times \frac{z^2}{6}$	$= \left[(6)^{100} \times -5\right] \div (6)^{100} = 1 \times -5$
	$(z/2)$	-5

29) Find the value of

a)	$3.56 \times (10)^n = 356$	$0.23 \times 10^3 = n$
	$(10)^n = \frac{356}{3.56} = 100$	$0.23 \times 1000 = n$
	$(10)^n = (10)^2$	$n = 230$
	$n = 2$	$n = 230$
b)	$n \times 10^5 = 6541$	$n \times \frac{1}{10^5} = 0.34$
	$n = \frac{6541}{100000}$	$n = 0.34 \times 100000$
	$n = 0.06541$	$n = 34{,}000$

30) Find a number which when decreased by 8% becomes 115.

$23 \times 4 = 92$

Let the # be x

$\frac{92}{100} \times x = 115$

$x = \frac{115 \times 100}{92}$

$x = \frac{5 \times 100}{4} = 25 = 125$

125

31) Find a number which when decreased by 13% becomes 261.

Let the # be x

87% of x = 261

$\frac{87}{100} \times x = 261$

$x = \frac{261 \times 100}{87}$

$x = 300$

300

32)

By what number should a given number by multiplied to increase its value by 20%

$\square \times x = \frac{120}{100} x$

$\square = 1.2$

1.2

By what number should a given number by multiplied to decrease its value by 30%

$1 - 0.3$

0.7

33) The price of a washing machine increased from \$860 to \$ 989. What was the percent increase in the price?

Increase = $989 - 860 = 129$

Original	Increase
860	129
100	x

Direct

$\frac{860}{129} = \frac{100}{x}$

$x = \frac{100 \times 129}{860}$

$x = 15$

15%

34) On increasing Anum's salary by 12%, her monthly salary will increase by \$1158. What was her original salary?

original	increase
100	12
x	1158

Direct

$\frac{100}{12} = \frac{x}{1158}$

$x = \frac{100 \times 1158}{12}$

$x = 100 \times 96.5$

$x = 9650$

\$ 9650

35)

C1	C2
what percent of 250 is 15	what percent of 12 is 0.12
$\frac{x}{100} = \frac{15}{250}$	$\frac{x}{100} = \frac{0.12}{12}$
$x = \frac{15 \times 100}{250}$ (3, 2, 5)	$x = \frac{100 \times 0.12}{12}$
	$x = 100 \times 0.01$
6%	1%

36) Find the value of

a)

C1	C2
$n \times 10^{-4} = 0.000104$	$9.2 \times n = 0.0092$
$n = \frac{0.000104}{10^{-4}} = 0.000104 \times 10^{4}$	$n = \frac{0.0092}{9.2}$
$n = 1.04$	$n = (1/1000)$

b)

$7.24 \times 10^{n} = 0.00724$	$5 \times 10^{n} = 0.005$
$10^{n} = \frac{7.24 \times 10^{-3}}{7.24}$	$10^{n} = \frac{5 \times 10^{-3}}{5}$
$10^{n} = 10^{-3}$	$10^{n} = 10^{-3}$
$n = -3$	$n = -3$

37) Simplify $(2x^2 + 3x - 6)(5 + 3x)$

$= 2x^2(5+3x) + 3x(5+3x) - 6(5+3x)$

$= 10x^2 + 6x^3 + 15x - 30$

$+9x^2 \quad -18x$

$19x^2 + 6x^3 - 3x - 30$

$6x^3 + 19x^2 - 3x - 30$

38) Name all the quadrilaterals below that have the following properties

Quadrilateral	Trapezoid	Isosceles Trapezoid	Parallelogram
Square	Rhombus	Kite	Rectangle

a) Diagonals are congruent

Square, Rectangle, Isosceles Trapezoid

b) Diagonals bisect each other

Square, Rectangle, Parallelogram, Rhombus

c) Diagonals are perpendicular to each other

Square, Rhombus, Kite

d) Opposite sides are congruent

Square, Rectangle, Parallelogram, Rhombus

e) Opposite sides are parallel

Square, Rectangle, Parallelogram, Rhombus

f) Opposite angles are congruent

Square, Rectangle, Parallelogram, Rhombus

39) Simplify $(5-x+3x^2)(4x+5)$

$=5(4x+5)-x(4x+5)+3x^2(4x+5)$

$= 20x+25 \quad -4x^2$

$-5x \quad +15x^2+12x^3$

$15x+25+11x^2+12x^3$

$12x^3+11x^2+15x+25$

40) The store purchased a scooter for $6500. At what price should they sell the scooter to make a profit of 15%

Selling Price

$= \frac{115}{100} \times 6500 = \$7475$

$ 7,475

41) Sam bought 70 liters of lemonade concentrate at $15 per liter and sold it all for $1260. Did she make a profit or loss in the transaction and by how much?

CP (Lemonade) $= \$70 \times 15 = \$1050$

SP (Lemonadde) $= \$1260$

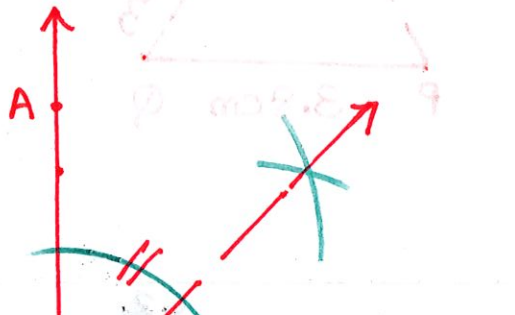
Profit $= \$210$

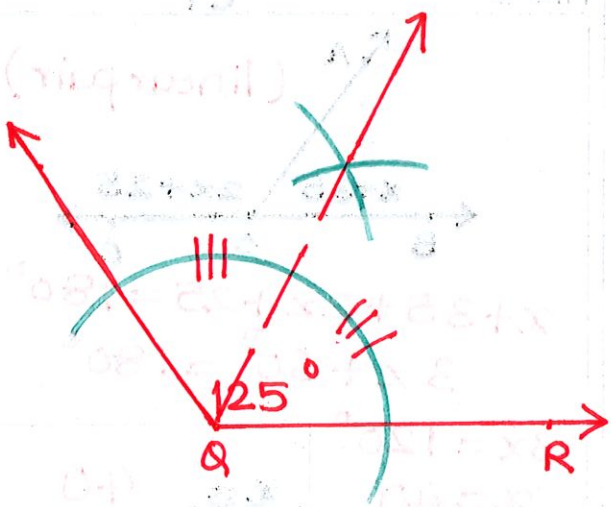
Profit% $= \frac{210}{1050} \times 100 = 20\%$

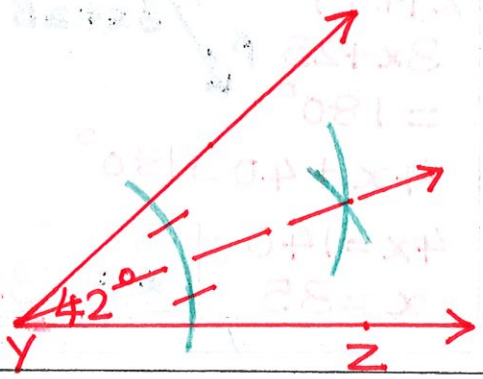
20% Profit

42) Draw the following angles using a protractor and bisect them

$\angle ABC = 90°$	$\angle PQR = 125°$	$\angle XYZ = 42°$



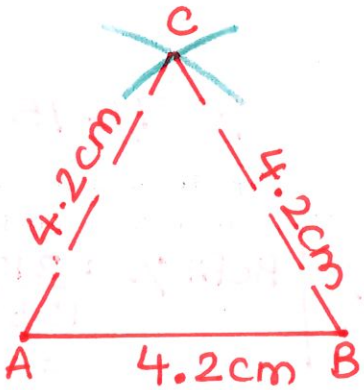


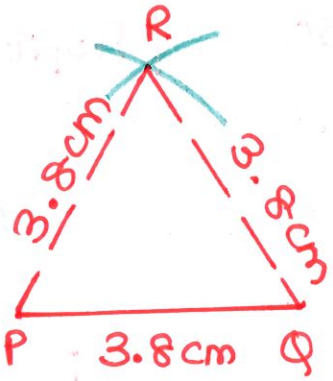


43) Construct the following triangles

a) $\triangle ABC$ *is an equilateral triangle with each side* $4.2\ cm$

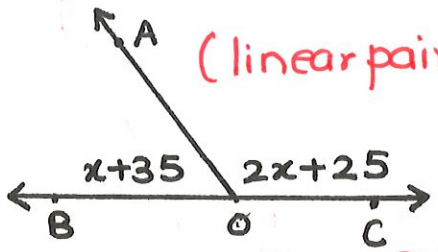
b) $\triangle PQR$ *is an equilateral triangle with each side* $3.8\ cm$





44) Find x

C1



(linear pair)

$x+35+2x+25=180^\circ$

$3x+60^\circ=180^\circ$

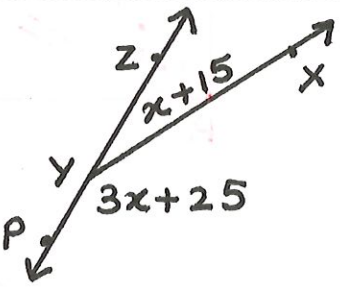
$3x=120^\circ$

$x=40$

$x=$ 40

C2

Linear pair



$x+15+3x+25=180^\circ$

$4x+40=180^\circ$

$4x=140$

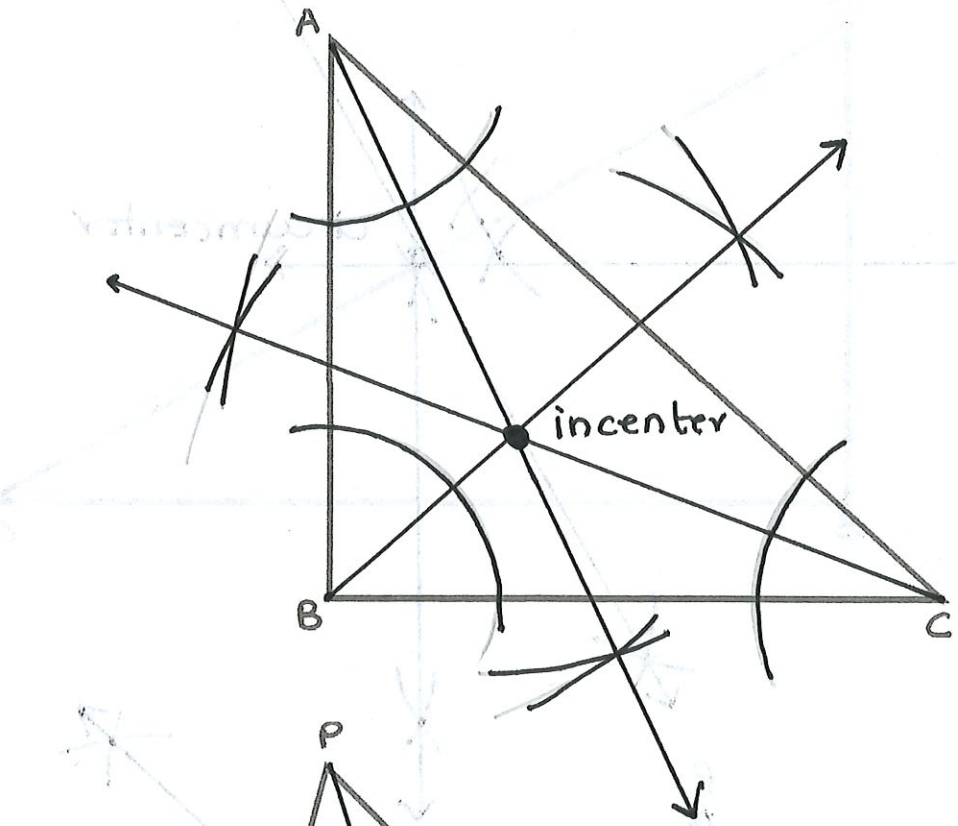
$x=35$

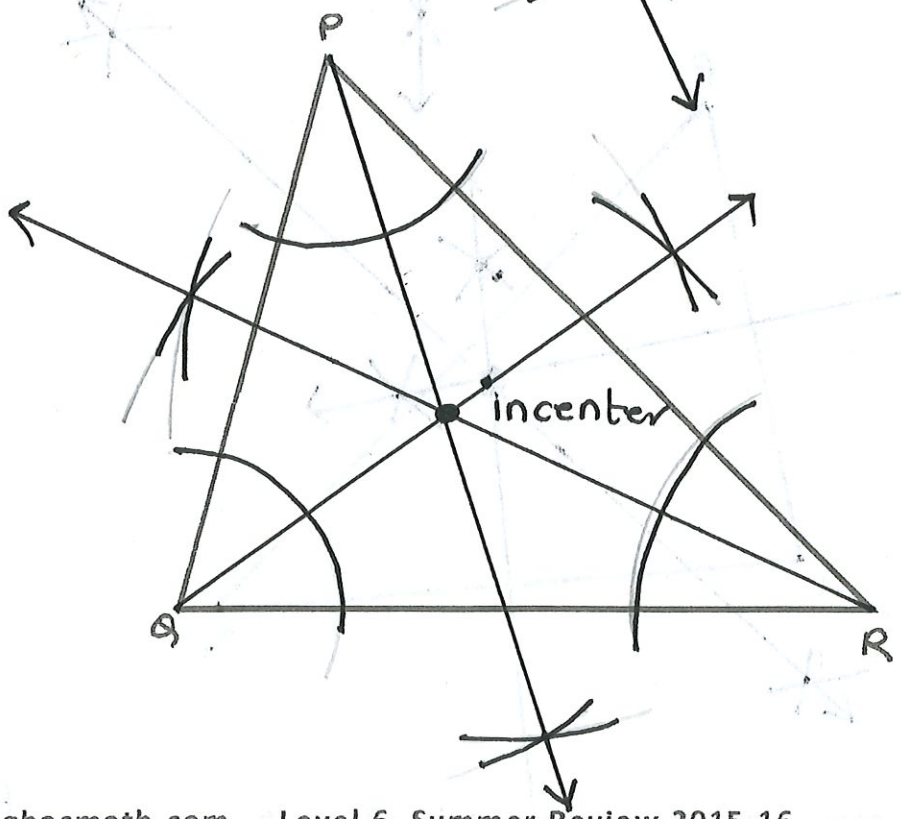
$x=$ 35

Answer key

45) **Draw the angle bisectors to all the three angles of the given triangles**

Important:
(The point of intersection of the angle bisectors of a triangle is called the incenter)

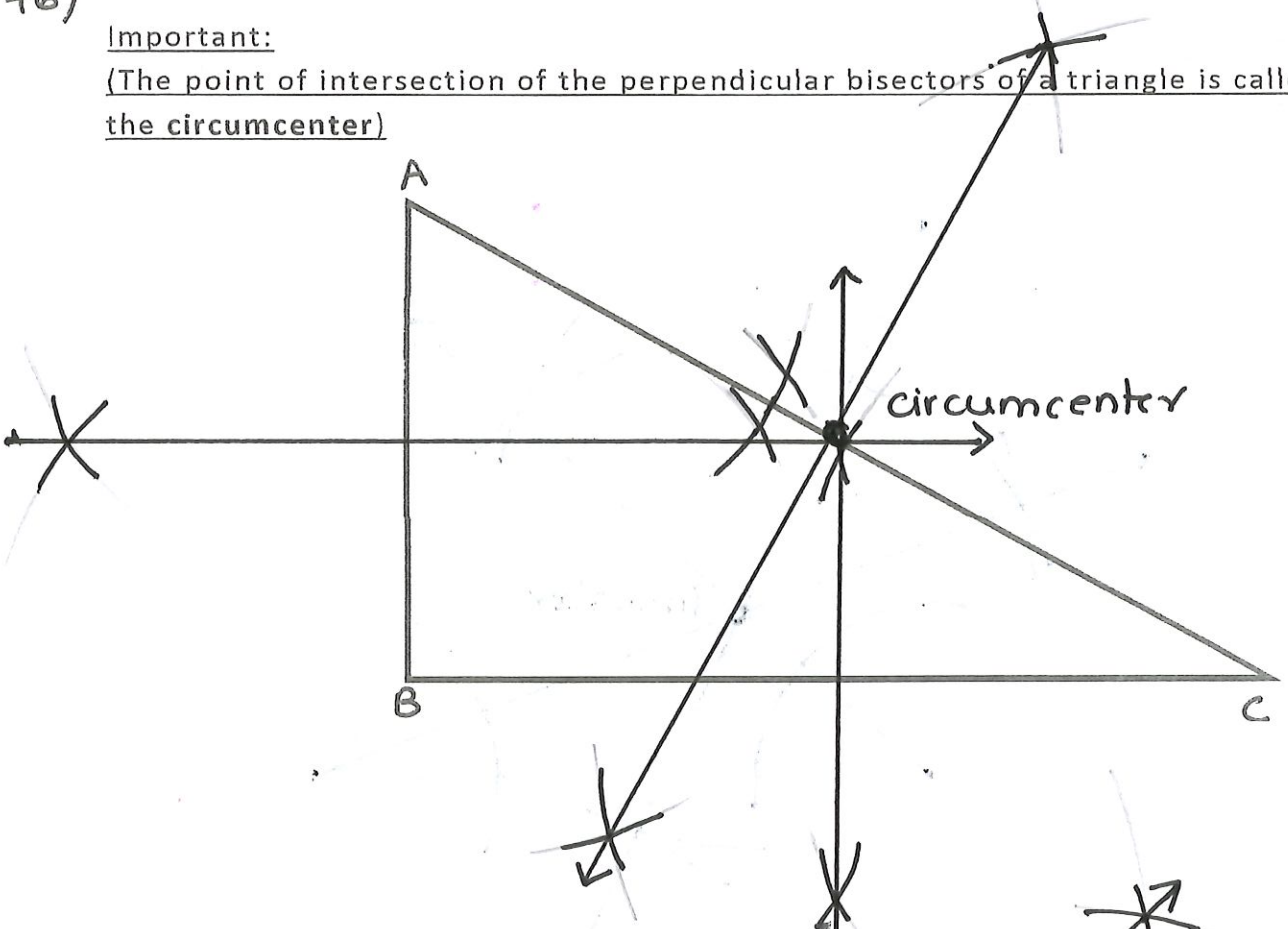


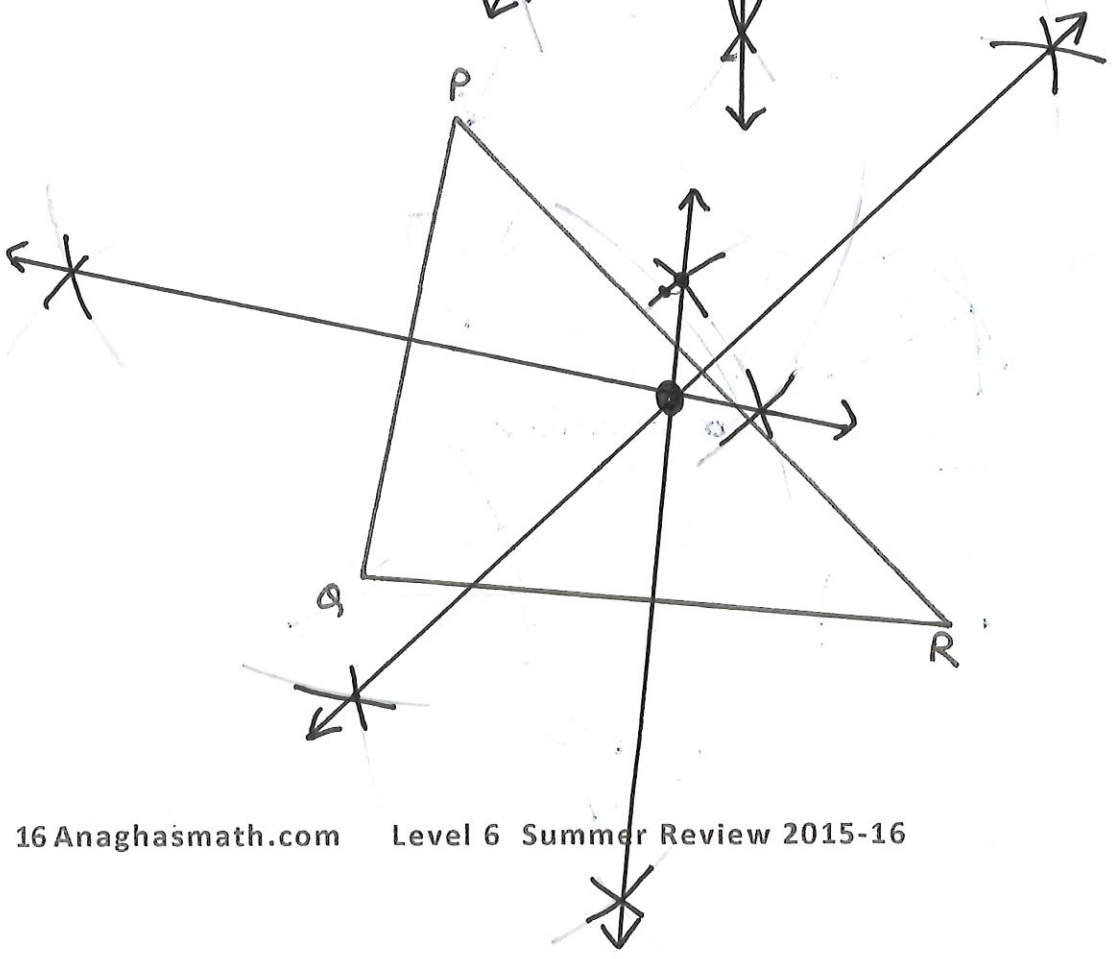


Answer key

46) Draw the perpendicular bisectors to all the three sides of the given triangles

Important:
(The point of intersection of the perpendicular bisectors of a triangle is called the circumcenter)

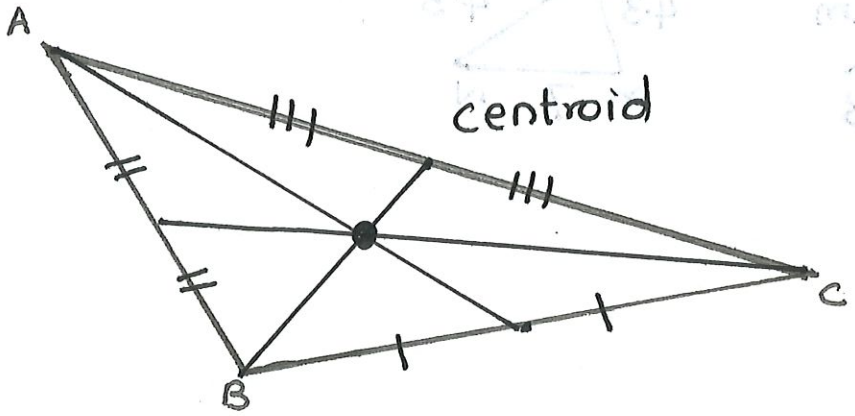


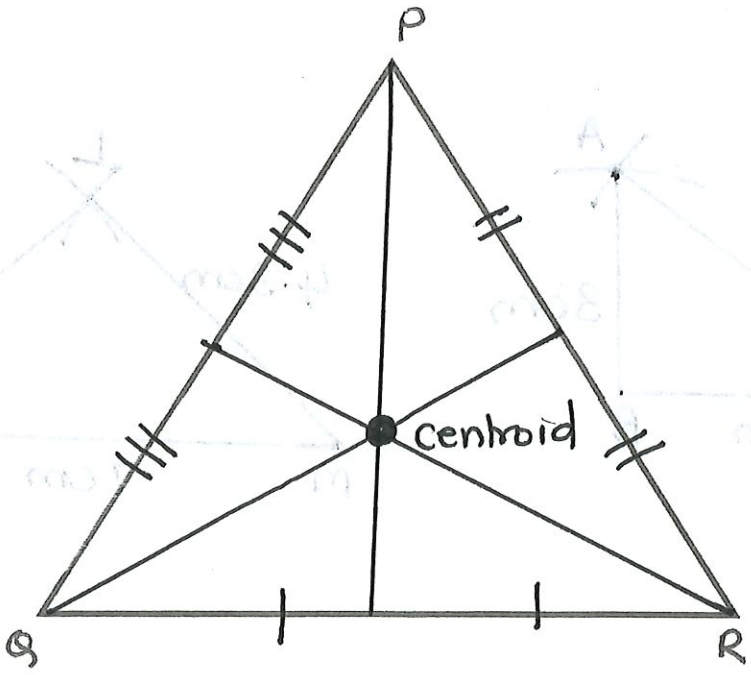


Answer Key

Draw the medians to all the three sides of the given triangles

47) Important:
(A median is a segment joining the vertex of a triangle with the midpoint of the opposite side. The point of intersection of the medians of a triangle is called the **Centroid**).



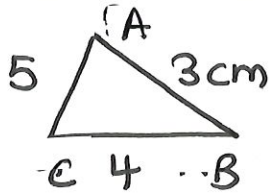


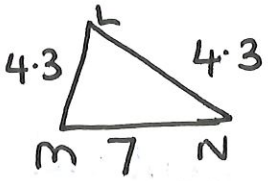
Answer key

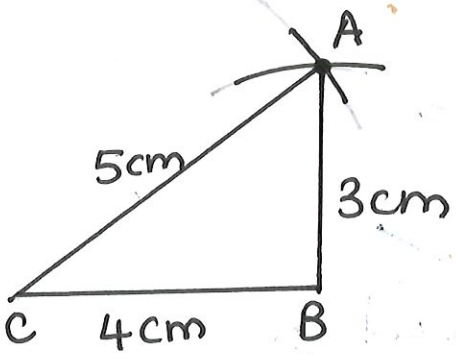
48) Draw the following (Hint: Always draw a rough figure first)

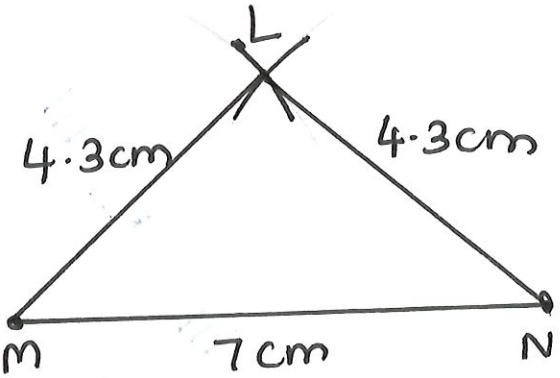
1. ΔABC Such that $AB = 3cm$, $BC = 4cm$, $AC = 5cm$

2. ΔLMN Such that $LM = 4.3cm$, $MN = 7cm$, $NL = 4.3cm$









49) Two supplementary angles are in the ratio **4:5**. Find the measure of the smaller angle.

Let the common factor be x

$4x + 5x = 180^\circ$

$9x = 180$

$x = 20$

Smaller angle

80°

50) Two supplementary angles are in the ratio **7:8**. Find the measure of the smaller angle.

Let the common factor be x

$7x + 8x = 180^\circ$

$15x = 180^\circ$

$x = 12$

Smaller $\angle = 7 \times 12$

84°

51) If 16 men can reap a farm in 30 days, how many days will 20 men take to reap the same farm at the same rate?

men	days
16	30
20	x

Inverse

$16 \times 30 = 20 \times x$

$x = \frac{16 \times 30}{20} = 24$

24 days

52) 30% of the total candidates failed a test. If 336 candidates passed the test, how many students took the test?

70% passed

Let total students be x

$\frac{70}{100} = \frac{336}{x}$

$x = \frac{100 \times 336}{70}$

$x = 48 \times 10$

480 students

53) Fill in the blanks

$\frac{a}{b} \times \frac{b}{a} = 1$

a) The product of a rational number and its reciprocal is 1

$\frac{a}{b} + \left(\frac{-a}{b}\right) = 0$

b) The sum of a rational number and its opposite is 0

c) A cube is a rectangular prism with all its sides equal

d) A rectangular prism has 6 faces, 8 vertices and 12 edges.

e) 0.3 expressed as a fraction is $\frac{3}{10}$

54) Identify if a polynomial (Yes / No). If Yes, State the degree of the polynomial

a)	$(4/3)x^2 - 5x + 17$	Yes / No	Degree = 2
b)	$8x^2 - 4x - 6\sqrt{x} - 1$	Yes / No	Degree = –
c)	$5x^2 - (2/x) + 3$	Yes / No	Degree = –
d)	$4x^3 - 3xy^2 - y^3z$	Yes / No	Degree = 4
e)	$ab^2 - (7/a^2)$	Yes / No	Degree = –
f)	$(4/3)x^2y^2$	Yes / No	Degree = 4

55) Simplify

1) $(2x + 9y - 7z) + (3y + z - 3x)$

$2x + 9y - 7z$
$-3x + 3y + 1z$

$-1x + 12y - 6z$

2) $(2x - 9y + 7z) - (3y - z + 3x) - (2y - x)$

$2x - 9y + 7z$
$-3x - 3y + 1z$
$+1x - 2y$

$-14y + 8z$

3) $(2/3)x^2 - 5x^2 - (1/4)x^2 + 6x^2 + (1/4)x^2$

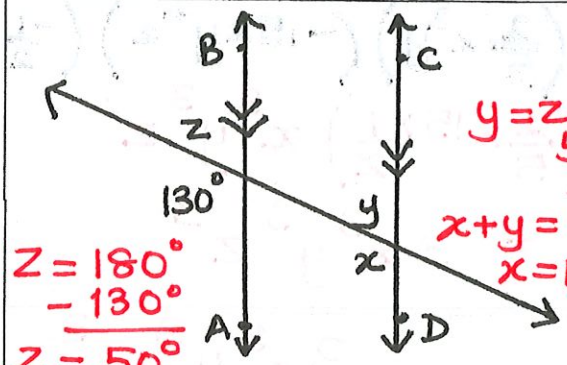
$\frac{2}{3}x^2 - 5x^2 - 1/4\,x^2$
$+6x^2 + 1/4\,x^2$

$\frac{2}{3}x^2 + 1x^2$ ⇐

$(5/3)x^2$

56) Find x, y, z

C1



$y = z = 50°$

$x + y = 180°$

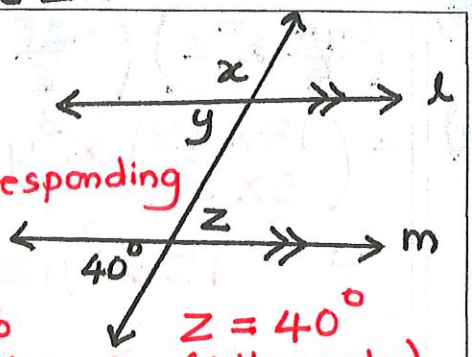
$x = 130°$

$z = 180° - 130°$

$z = 50°$

C2

$l \parallel m$



$y = 40°$ Corresponding

$x = 180 - 40$

$x = 140°$ (linear)

$z = 40°$ (Alternate)

$z = 50°$	$y = 50°$	$x = 130°$	$x = 140°$	$y = 40°$	$z = 40°$

57) Simplify

1) $(3x^3 + 2x^2 - 6x + 3) - (2x^3 - 3x^2 - 4) + (2x - 4x^2)$

$3x^3 + 2x^2 - 6x + 3$

$-2x^3 + 3x^2 + 4$

$-4x^2 + 2x$

$$1x^3 + 1x^2 - 4x + 7$$

2) $(3z^3 - z^2 + 5) - (1 - 2z + z^2) + (3 + 2z - z^3)$

$3z^3 - 1z^2 + 5$

$-1z^2 - 1 + 2z$

$-1z^3 + 3 + 2z$

$$2z^3 - 2z^2 + 4z + 7$$

3) $(a^3 + 3a - a^2 - 6) - (2a^2 + a - 2a^3 + 3)$

$1a^3 - 1a^2 + 3a - 6$

$+2a^3 - 2a^2 - 1a - 3$

$$3a^3 - 3a^2 + 2a - 9$$

58) Simplify

C1

a) $\left(\frac{-18}{5}x^2z\right)\left(\frac{-25}{6}xz^2y\right)$

$= \left(\frac{18\times25}{5\times6}\right)x^3yz^3$

$= 15x^3yz^3$

$15x^3yz^3$

b) $\left(\frac{-3}{4}xy^3\right)\left(\frac{-2}{3}x^2y^4\right)$

$\left(\frac{3}{4}\times\frac{2}{3}\right)x^{3}y^{3+4}$

$\left(\frac{1}{2}\right)x^3y^7$

$\left(\frac{1}{2}\right)x^3y^7$

C2

$\left(\frac{2}{5}x^2y\right)\left(-15xy^2z\right)\left(\frac{-1}{2}z^2\right)$

$\left(\frac{\cancel{2}}{5}\times15\times\frac{1}{\cancel{2}}\right)x^3y^3z^3$

$= 3x^3y^3z^3$

$3x^3y^3z^3$

$\left(\frac{1}{4}ab\right)\left(-6b^2\right)\left(\frac{-1}{3}c\right)$

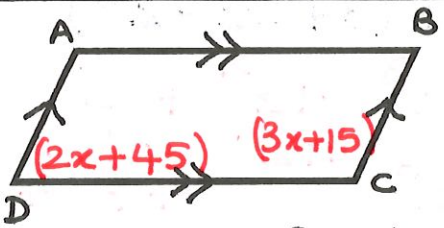
$= \left(\frac{1}{4}\times\cancel{6}^{2}\times\frac{1}{\cancel{3}}\right)ab^3c$

$= \left(\frac{1}{2}\right)ab^3c$

$\left(\frac{1}{2}\right)ab^3c$

59) Find the measure of the unknown

C1



□ ABCD is a Parallelogram

$\angle D = 2x+45^\circ$

$\angle C = 3x+15^\circ$

$2x+45+3x+15 = 180^\circ$

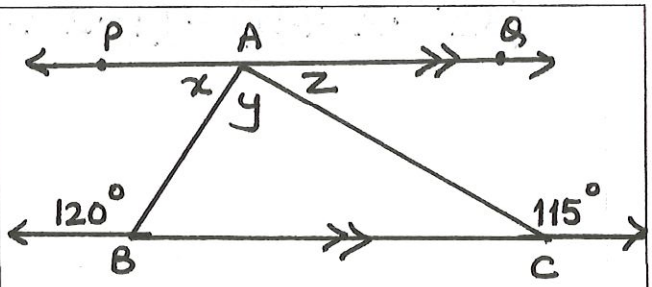
$5x+60 = 180^\circ$ $x=24$

$5x = 120^\circ$ $\angle B = 2x24+45$

$\angle B = 93^\circ$

48+45

C2



PQ ∥ BC

$x = 180^\circ - 120^\circ = 60^\circ$

$z = 180^\circ - 115^\circ = 65^\circ$

$y = 180-(60+65)^\circ$

$y = 180^\circ - 125^\circ = 55^\circ$

$x = 60^\circ$ $y = 55^\circ$ $z = 65^\circ$

60) Find the value of the variable

C1

$\frac{(8-3x)}{(5+3x)} = \frac{2}{3}$

$3(8-3x) = 2(5+3x)$

$24 - 9x = 10 + 6x$

$24 - 10 = 6x + 9x$

$14 = 15x$

$x = 14/15$

C2

$\frac{(2x+3)}{(3+x)} = \frac{3}{2}$

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

$4x + 6 = 9 + 3x$

$4x - 3x = 9 - 6$

$x = 3$

$x = 3$

61)

$(2-3x) > (5-x)$

where x is an integer

$2 - 3x > 5 - x$

$+3x \quad +3x$

$2 > 5 + 2x$

$-5 \quad -5$

$-3 > 2x$

$x < -\frac{3}{2}$

$-2, -3, -4$

$x = -2, -3, -4 \ldots$

$-2(5x+3) > 7$

where x is a Natural #

$-10x - 6 > 7$

$+6 \quad +6$

$-10x > 13$

$\frac{-10x}{-10} > \frac{13}{-10}$

$x < -1.3$

Natural #

No solution

62)

$-2(2x+1) < 14$

where x is an integer

$-4x - 2 < 14$

$+2 \quad +2$

$-4x < 16$

$\frac{-4x}{-4} < \frac{16}{-4}$

$x > -4$

$-3, -2, -1, 0, 1, 2, 3 \ldots$

$-2x + 4 > 16$

where x is a whole #

$-2x + 4 > 16$

$-4 \quad -4$

$-2x > 12$

$\frac{-2x}{-2} > \frac{12}{-2}$

$x < -6$

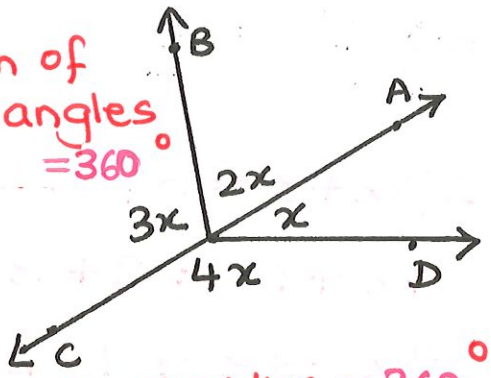
There is no whole # less than 0

No value for x

Find x

63) C1

a)



Sum of all angles $= 360^\circ$

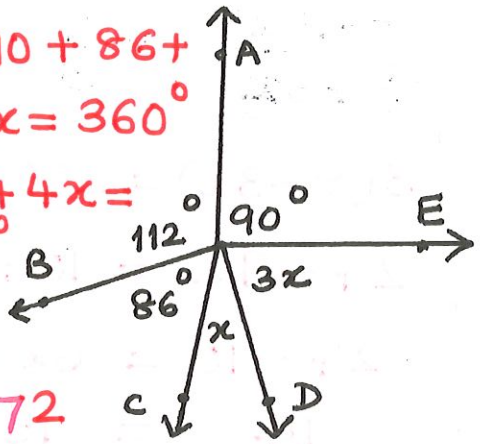
$2x + 3x + 1x + 4x = 360^\circ$

$10x = 360^\circ$

$x = 36$

$x = 36$

C2



$112 + 90 + 86 + x + 3x = 360^\circ$

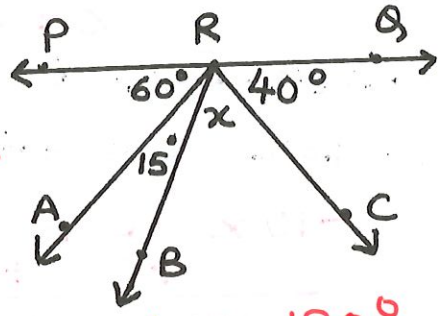
$288 + 4x = 360^\circ$

$4x = 72$

$x = \frac{72}{4} = 18$

$x = 18$

b)



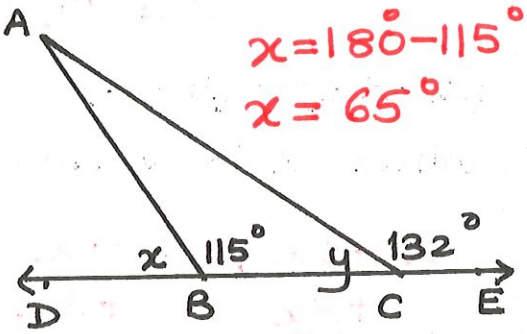
Linear pair $= 180^\circ$

$60 + 15 + x + 40 = 180^\circ$

$115 + x = 180^\circ$

$x = 65^\circ$

65°



$x = 180^\circ - 115^\circ$

$x = 65^\circ$

$y = 180 - 132^\circ$

$y = 48^\circ$

x	y
65°	48°

64) Find the sum of all angles of

Nonagon (9 sides)	dodecagon (12 sides)	20 sided polygon
Sum(all angles) $= (n-2) \times 180^\circ$ $= (9-2) \times 180^\circ$ $= 7 \times 180^\circ$	Sum(all angles) $= (12-2) \times 180^\circ$ $= 10 \times 180^\circ$ $=$	$(20-2) \times 180^\circ$ $= 18 \times 180^\circ$
1260°	1800°	3240°

65) Fill in the blanks

a) A simple closed figure bounded by three or more sides is called a Polygon

b) A line segment joining the non-adjacent sides vertices of a polygon is called the diagonal

c) If two geometric figures have the same shapes and size they are called congruent

d) A segment joining the vertex of a triangle to the midpoint of its opposite side is called median

e) A perpendicular drawn from the vertex of a triangle to the opposite side is called Altitude

f) A ray that cuts an angle into two equal parts is called Angle bisector

g) The point of intersection of the three angle bisectors of a triangle is called the incenter

h) The point of intersection of the three medians of a triangle is called the centroid

i) The greatest number that divided each of the given numbers exactly is called Greatest common factor (GCF)

j) The least number which is divisible by each of the given numbers exactly is called Least common multiple (LCM)

k) The product of HCF and LCM = product of two #'s

66) Find the greatest number that divides **513**, **1134** and **1215** exactly

÷	513 , 1134 , 1215
9	57 , 126 , 135
3	19 , 42 , 45

GCF = 27

27

67) Find the greatest number which divides **77** and **121** to leave the remainder **8** and **6** respectively?

77 − 8 = 69

121 − 6 = 115

÷	69 , 115
23	3 , 5

The number is

23

68) Find the greatest number which divides **645** and **790** to leave the remainder **7** in each case?

645 − 7 = 638

790 − 7 = 783

÷	638 , 783
29	22 , 27

The number is

29

69) A drum of water is 3/7th full. When 28 liters of water is drawn from it, it is just 5/14th full. Find the total capacity of the drum in liters

Let the full capacity of the tank be x liters

$\frac{3}{7}x - \frac{5}{14}x = 28$

$\frac{6}{14}x - \frac{5}{14}x = 28$

$\frac{1}{14}x = 28$

$x = 28 \times 14$

392 liters

70) The product of two fractions is 7. If one of them is $18\frac{1}{5}$, find the other number

Let the other fraction be x

$7 = x \times \left(18\frac{1}{5}\right)$

$7 = x \times \frac{91}{5}$

$x = \frac{7 \times 5}{91}$

$x = \frac{35}{91} = \frac{5 \times 7}{13 \times 7}$

5/13

71) 60% of 80 is what percent of 40% of 180 (round to the nearest tenth)

60% of 80 = x% of 40% of 180

$\frac{60}{100} \times 80 = \frac{x}{100} \times \frac{40}{100} \times 180$

$60 \times 200 = x \times 180$

$x = \frac{60 \times 200}{180} = \frac{200}{3}$

66.67%

72) Simplify : $\sqrt[3]{1512}$

3 | 1512
3 | 504
2 | 168
84

2 | 84
2 | 42
3 | 21
7

$\sqrt[3]{3 \times 3 \times 3 \times 2 \times 2 \times 2 \times 7}$

$= 3 \times 2 \sqrt[3]{7}$

$6\sqrt[3]{7}$

73) Find the value of : $-\left[\frac{1}{2}\right] * -\left[\frac{2}{3}\right] * -\left[\frac{3}{4}\right] * -\left[\frac{4}{5}\right] * \ldots\ldots - \left[\frac{99}{100}\right]$

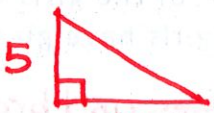
There are 99 #'s

So overall the product is −ve

$-\left[\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \cdots \times \frac{99}{100}\right]$

$-\frac{1}{100}$

74) What is the length of the hypotenuse of a right angled triangle with the two other sides 5 cm and 12 cm



$(hyp)^2 = 12^2 + 5^2$

$(hyp)^2 = 144 + 25$

$(hyp)^2 = 169$

hyp = 13 cm

13 cm

75) What is the area of a circle whose circumference is π cm

$C = \pi D$

$\pi = \pi D$

Diameter = 1cm

Radius = 0.5cm

$Area = \pi R^2$

$= \pi (0.5)^2$

Area = 0.25π cm^2

76) A stack of CD's fit perfectly in a cylindrical container. Each CD has a circumference of 10π cm and a thickness of 3 mm. Find the volume of a stack of 50 CD's

Volume = $\pi R^2 H \times 50$

Circumference = πD

$10\pi = \pi D$

$D = 10$ cm

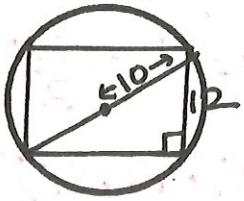
Radius = 5 cm

Volume = $\pi \times 5 \times 5 \times 0.3 \times 50$

Volume = 375π cm^3

375π cm^3

77) A rectangle is inscribed in a circle of radius 10 inches. If one of the rectangles sides measures 12 inches, what is the perimeter of the rectangle?



Other side of rectangle ?

$= (20)^2 - (12)^2$

$= 400 - 144$

$l^2 = 256$

$l = 16$ inches

Perimeter $= 2(16) + 2(12)$

56 inches

78) find x if $(2x+2)$, $(6x-2)$ *and* $(10-6)$ are equal numbers

$2x + 2 = 6x - 2$

$-2x \quad -2x$

$2 = 4x - 2$

$4x = 4$

$x = 1$

$x = 1$

79) The sum of 3 consecutive even numbers is 2010. What is the smallest number?

$3 \overline{)2010}$ = 670

-18

21

21

Middle # = 670

Smallest # = 668

668

80) The number of boys at a school is 2/3rd the number of girls. 1/4th of the girls wear glasses and 1/8th of the girls who wear glasses have braces. If 3 girls have glasses and braces how many students are in the school?

Let the # of girls be x

boys $= \frac{2}{3}x$

girls with glasses $= \frac{1}{4}x$

girls with glasses and braces $\frac{1}{8}\left(\frac{1}{4}x\right) = \frac{1}{32}x$

$x = 96$

boys $= \frac{2}{3} \times 96 = 64$

Total Students = 160

81) A backyard is 1300 square feet. 12% of the yard is occupied by a trampoline. What will be the diameter of the largest circular trampoline? Diameters of the trampoline come in whole numbers. (π = 3.14)

12% of 1300

$= \frac{12}{100} \times 1300$

$= 12 \times 13$

$= 156$ sq feet

Area (circle) = 156

$\pi R^2 = 156$

$R^2 = \frac{156}{3.14}$

$R^2 = 49.68$

$R^2 = 49$

$R = 7$ feet

diameter

14 feet

82) Anna invested $6500 for 2.25 years at 4% per year at simple interest. How much was the total amount she recovered at the end of the full term?

$I = \frac{PRT}{100}$

$I = \frac{6500 \times 4 \times 9}{4 \times 100} = 585$

Amount Recovered $= \$6500 + 585$

$\$ 7085$

83) Challenge By how much percent will the area of a square increase by if the side of the square is increased by 20%

Original Side = 1

New side $= \frac{6}{5}(1)$

Area $= \frac{6}{5} \times \frac{6}{5} = \frac{36}{25}$

New Area $= 1.2 \times 1.2$

$= 1.44$

Increase

44%.

84) Challenge Anna can finish a work by herself in 8 days and Ben can finish it in 4 days working alone. If both Anna and Ben work together, how much part of the work will they have completed in 2 days?

	Anna	Ben	Together
	8 days	4 days	
work/day	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}+\frac{1}{4}$

$\frac{1}{8} + \frac{1}{4} = \frac{1}{8} + \frac{2}{8} = \frac{3}{8}$

work done (2 days)

$= 2 \times \frac{3}{8}$

$\frac{3}{4}^{th}$ work

85) Challenge Faucet A, alone fills a tank in 3 hours and faucet B alone can fill the tank in 2 hours. How many hours will both the faucets open fill the whole the tank?

	A	
Time	3	
Tank filled/hour		

Question not worded properly so you can ingore this question

hour

$= \frac{2}{6} + \frac{3}{6} = \frac{5}{6}$ hours

$\frac{1}{5}$ min

72 minutes

86) The volume of a cube is 512 cubic cm. what is the length of each side?

$(side)^3 = 512$

$(side)^3 = (8)^3$

Side = 8 cm

8 cm

87) 88 meter long wire is bend in the shape of a circle. Find the area of the circle.

Circumference = 88 m

$\pi D = 88$

$\frac{22}{7} \times D = 88$

$D = \frac{88 \times 7}{22}$

D = 28 m

R = 14 m

Area $= \pi R^2 = \frac{22}{7_1} \times 14 \times 14$

$616\ m^2$

88) If a number is increased by 5 times itself, the result is 144. Find the number?

Let # be x

$x + 5x = 144$

$6x = 144$

$x = \frac{144}{6}$

$x = 24$

Number = 24

89) At what rate percent will \$800 amount to \$1000 in 2 years if invested at simple interest?

$R = \frac{I \times 100}{PT}$

$R = \frac{200 \times 100}{800 \times 2}$

$R = \frac{100}{8}$

$R = \frac{25}{2}$

$R = 12.5\%$

90) Solve: $5(3x+4) - 8(6x-7) < 9x - 8$

$15x + 20 - 48x + 56 < 9x - 8$

$76 - 33x < 9x - 8$

$76 + 8 < 9x + 33x$

$84 < 42x$

$x > 2$

$x > 2$

91) The interior angle of a regular polygon is 11 times its exterior angle. How many sides does the polygon have?

Challenge question

Let # sides = n

Exterior angle $= \frac{360}{n}$

Each (interior $\angle$) $= \frac{(n-2) \times 180}{n}$

$(n-2) \times 180 = 360^\circ \times 11$

$(n-2) = 2 \times 11$

$n = 24$

24 sides

92) The average weight of 4 people is 67 kilograms. When a fifth person joins in the average weight is reduced by 2 kilograms. What is the weight of the fifth man?

Let the weight of 5th person be x

weight (4 people) $= 67 \times 4 = 268$ kg

$\frac{268 + x}{5} = 65$

$268 + x = 325$

$x = 325 - 268$

57 kg

57 kg

93) 15% is to be added to a $120 pair of shoes. Find the total price.

$\left(\frac{15}{100} \times 120\right) + 120$

$= 18 + 120$

$= 138$

$ 138

94) If you roll a die 90 times, about how many times would you expect to roll a 4?

$\frac{1}{6} \times 90$

$= 15$ times

15 times

95) find the value of $x^0 * x^2 * x^1 * x^{-7}$

$= x^{0+2+1-7}$

$= x^{3-7}$

$= x^{-4}$

$= \frac{1}{x^4}$

$\left(1/x^4\right)$

96) Solve: *4 to the power of 14 multiplied by 4 to the power of −20*

$= (4)^{14} \times (4)^{-20}$

$= (4)^{-6}$

$\left(1/4\right)^6$

97) A cereal box has a length of 8 inches, a width of $1\frac{3}{4}$ inches, and a height of $12\frac{1}{8}$ inches. What is the volume of the cereal box?

Volume = L x W x H

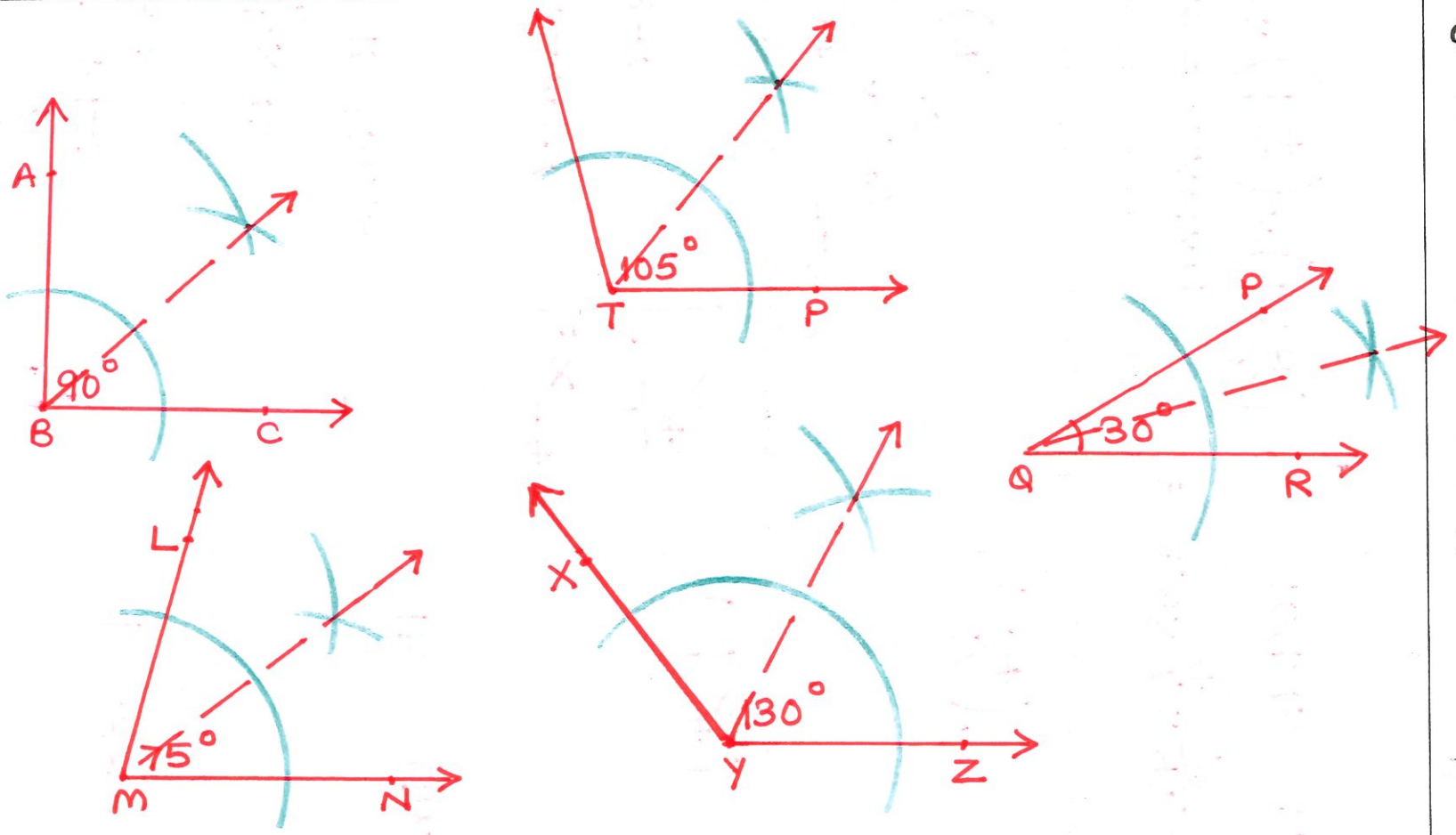
$= 8 \times \left(1\frac{3}{4}\right) \times \left(12\frac{1}{8}\right)$

$= \cancel{8} \times \frac{7}{4} \times \frac{97}{\cancel{8}} = 169.75$

169.75 inch^3

98) Draw the following angles and draw the angle bisectors

$\angle ABC = 90°$	$\angle LMN = 75°$	$\angle STP = 105°$	$\angle XYZ = 130°$	$\angle PQR = 30°$

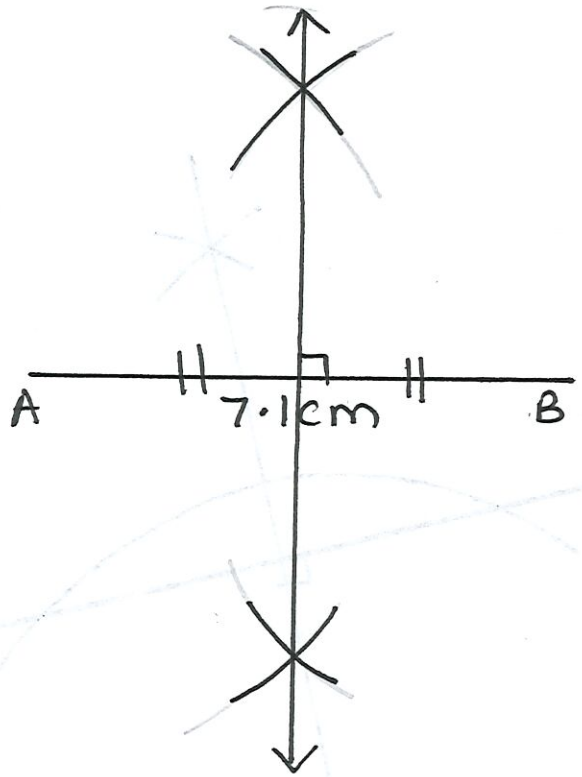


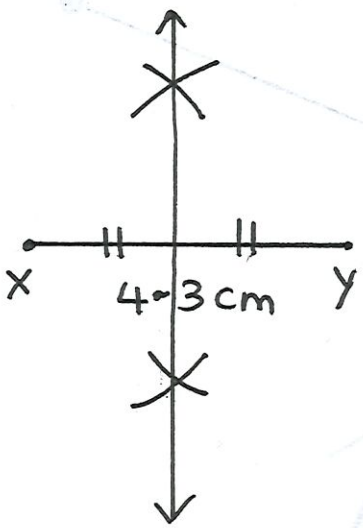
pg (32)

99) **Using a compass and a ruler, construct the following**

a) Draw segment AB = 7.1 cm and draw a perpendicular bisector to it.

b) Draw segment XY = 4.3 cm and draw a perpendicular bisector to it.

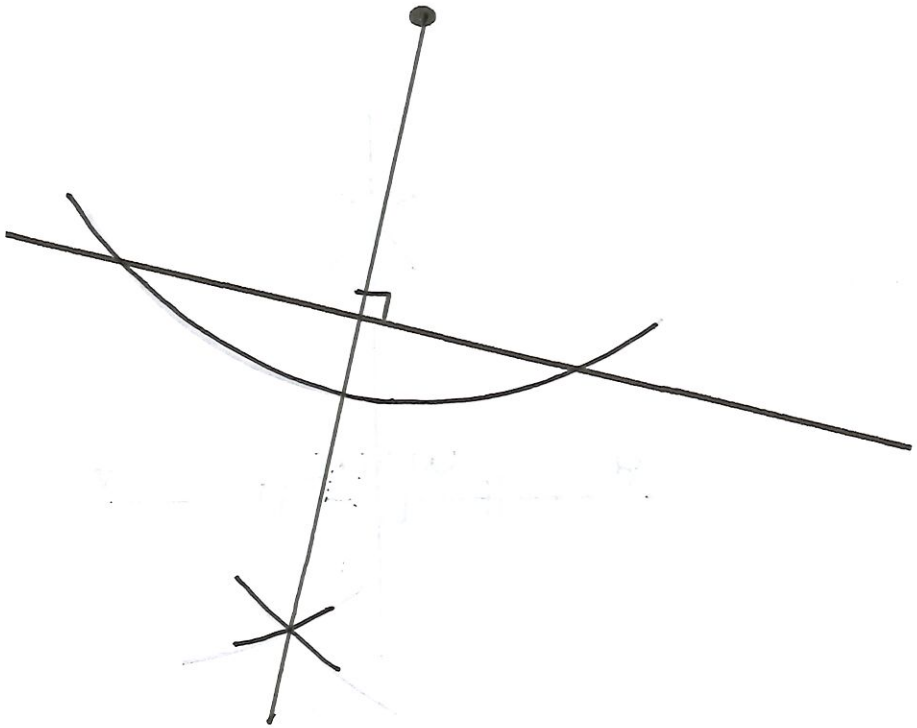


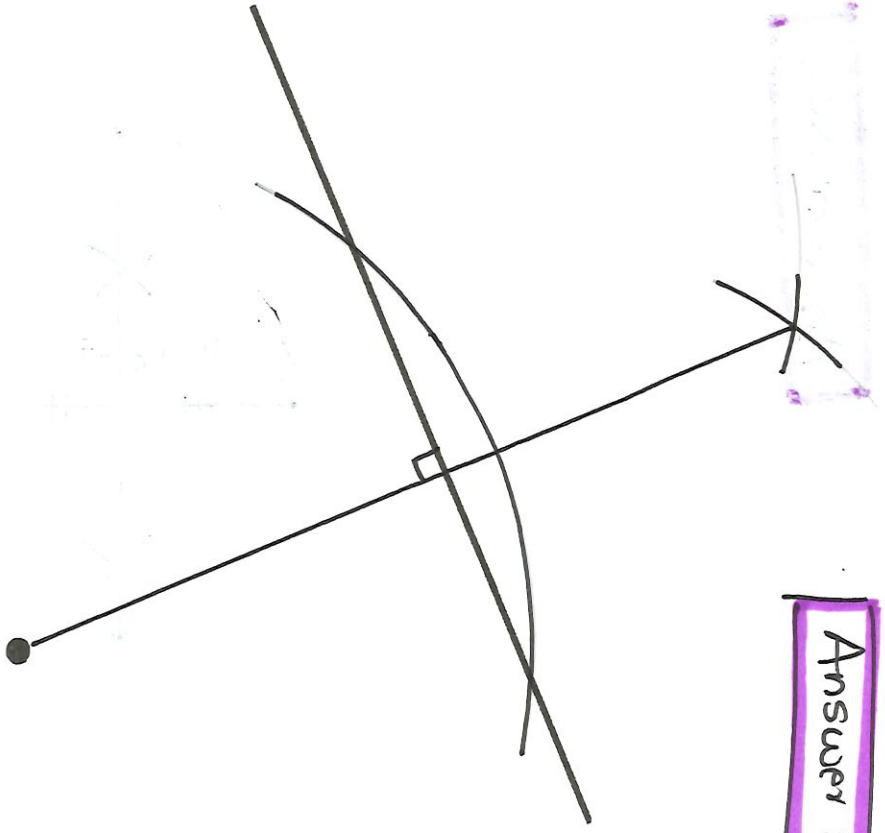


Answer Key

Pg 33

100) Draw a perpendicular (Altitude) to segment from the point outside the segment



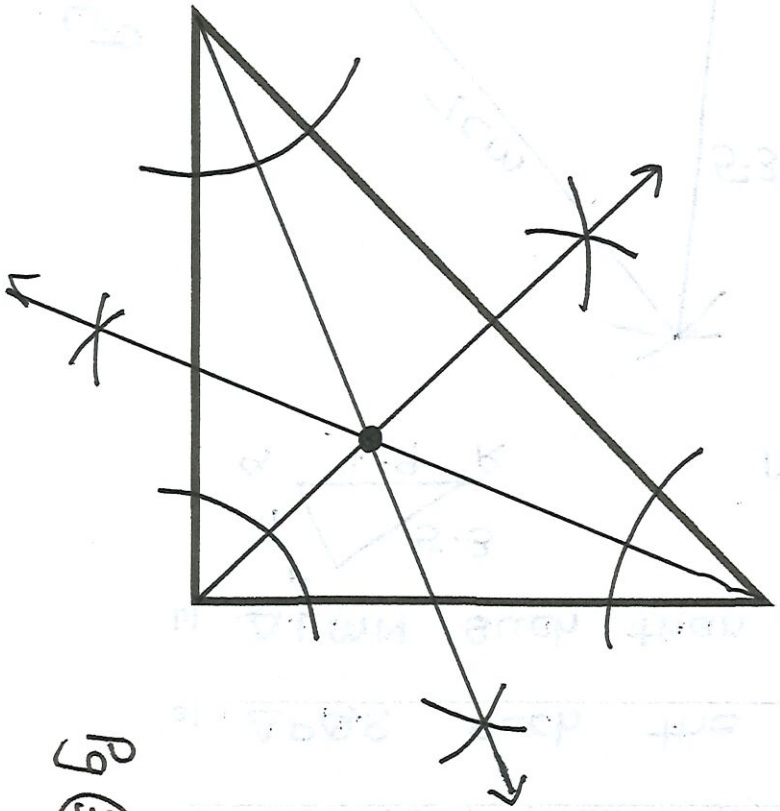


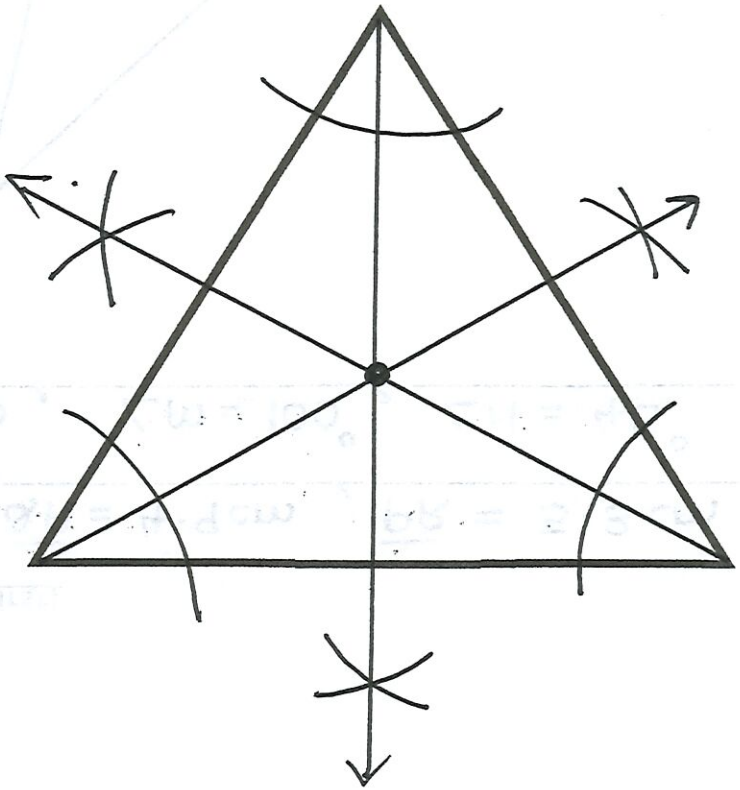
Answer key

Pg 34

101) **Draw the angle bisectors to all the three angles of the given triangles**

Important: (The point of intersection of the angle bisectors of a triangle is called the **incenter**)





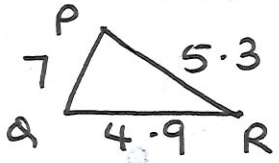
Answer key

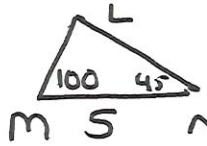
102)

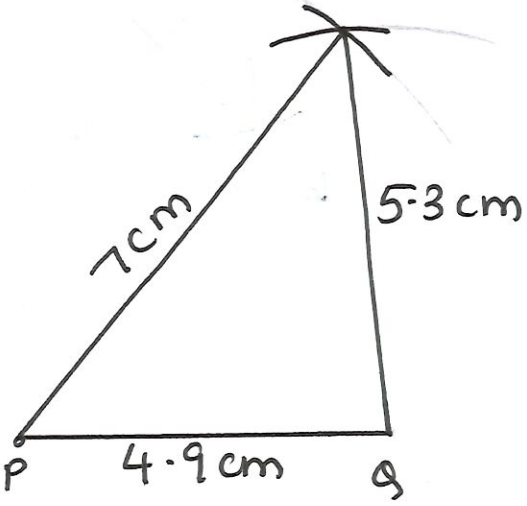
Draw the following (Hint: Always draw a rough figure first)

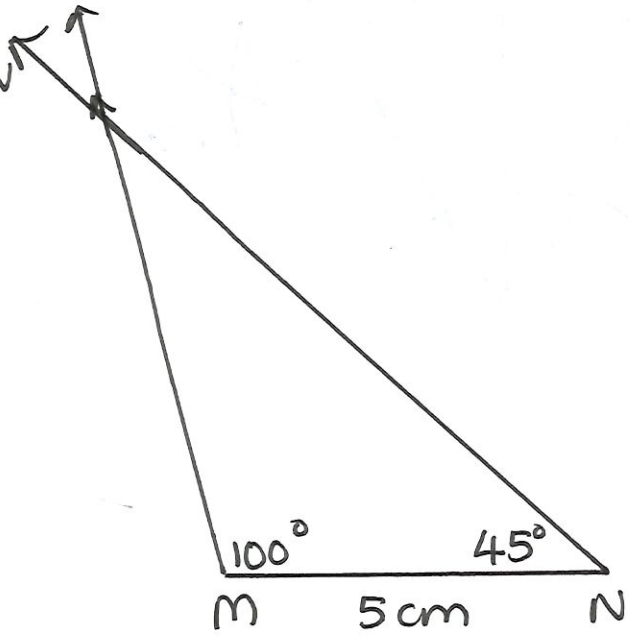
a) ΔPQR such the $\overline{PQ} = 7cm$, $\overline{QR} = 4.9cm$, $\overline{PR} = 5.3cm$

b) ΔLMN such than $MN = 5cm$, $\angle M = 100^\circ$, $\angle N = 45^\circ$







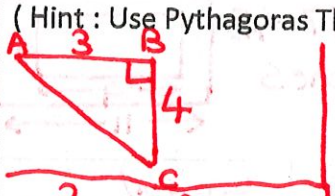


Pg (36)

Answer Key

Challenge Math

1 Josh walks 3 miles to the east, then 4 miles to the south. If he then back to the point at which he started, what is the total length he walked in miles?
(Hint : Use Pythagoras Theorem)



$AC^2 = 3^2 + 4^2$

$AC^2 = 9 + 16$

$AC^2 = 25$

$AC = 5$ miles

He walked $3 + 4 + 5$

12 miles

2 Evaluate: $2^5 + 2^5 + 2^5 + 2^5$

$2^5 = 32$

$(2 \times 2 \times 2 \times 2 \times 2)$

$2^5 \times 4$

$= 32 \times 4$

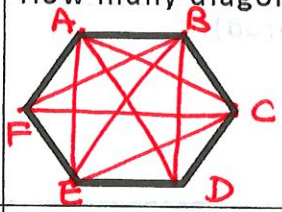
128

3 What is the sum of the first ten prime numbers?

$2+3+5+7+11+13+17+19+23+29 = 129$

129

4 How many diagonals are there in a hexagon?



$\frac{n(n-3)}{2}$

$\frac{6 \times (6-3)}{2}$

$= (6 \times 3)/2 = 9$

9 diagonals

5 How many diagonals are there in a decagon?

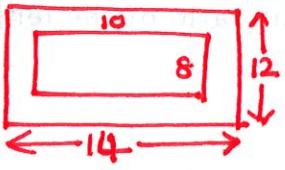
decagon = 10 sides

diagonals (#) =

$\frac{n(n-3)}{2} = \frac{10 \times 7}{2} = 5 \times 7$

35 diagonals

6 A photograph that is 8 inches by 10 inches is enlarged by 2 inches on each dimension. What is the percent increase in the area?



old area $= 10 \times 8$

$= 80$ in^2

New Area

$= 12 \times 14$

$= 168$ in^2

Increase

$= 168 - 80$

% Increase

$= \frac{88}{80} \times 100$

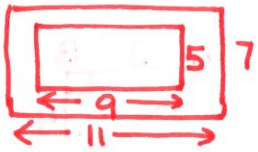
$= 110\%$

110%

6 - Pg (37)

Challenge Math

1 A photograph that is 5 inches by 9 inches is enlarged by one inch on each dimension. Estimate what is the percent increase in the area?



Old Area = 5x9
= 45 sq inch

New Area = 7x11
= 77 sq inch

Increase = 77-45
= 32 sq inches

% increase =
$\frac{32}{45} \times 100 = 71.1$

71.1 %

2 What is the value of x if the three sides of a triangle are x cm , 2x cm and 2x+3 cm. The perimeter of the triangle is 48 cm

$x + 2x + 2x + 3 = 48$

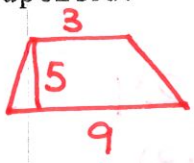
$5x + 3 = 48$

$5x = 45$

$x = 9$

$x = 9$

3 A trapezoid has two bases, one of which is 3 times as long as the other. If the height of the trapezoid is 5 and the longer base is 9, what is the area of the trapezoid?



Area (Trap)
$= \frac{(b_1 + b_2)}{2} \times ht$

$= \frac{(9+3)}{2} \times 5 = \frac{12 \times 5}{2}$

30 sq units

4 find the value of { square root of (13 squared – 12 squared)}

$\sqrt{13^2 - 12^2}$

$= \sqrt{169 - 144}$

$= \sqrt{25}$

$= \pm 5$

+5 or −5

5 Two complementary angles have a ratio of 5:1. What is the measure of the larger angle, in degrees?

Sum (complementary angles) = 90°

$x + 5x = 90°$

$6x = 90$

$x = 15$

Larger angle
= 15x5

75°

6 A piece of string 180 feet long is cut into 2 pieces. If the ratio of the lengths is 1:5, how long is the shorter piece of rope, in feet?

$1x + 5x = 180$

$6x = 180$

$x = 30$

Shorter piece
= 30 feet

30 feet

Product of binomials: (can be solved horizontally or vertically)

C1 C2

	vertically	horizontally
a)	$(a+b)(a+b)$ $a+b$ $\times\ a+b$ $+ab+b^2$ a^2+ab $a^2+2ab+b^2$	$(a+b)(a+b)$ $=a(a+b)+b(a+b)$ $=a^2+ab+ab+b^2$ $a^2+2ab+b^2$
b)	$(a-b)(a-b)$ $a-b$ $\times\ a-b$ $-ab+b^2$ a^2-ab $a^2-2ab+b^2$	$(a-b)(a-b)$ $=a(a-b)-b(a-b)$ $=a^2-ab-ab+b^2$ $a^2-2ab+b^2$
c)	$(a+b)(a-b)$ $a+b$ $\times\ a-b$ $-ab-b^2$ $+a^2+ab$ a^2-b^2	$(a+b)(a-b)$ $=a(a-b)+b(a-b)$ $=a^2-ab+ab-b^2$ a^2-b^2

6 - Pg 39

C1

Answer key

Product of binomials: (can be solved horizontally or vertically)

	C1 vertically	C2 horizontally
a)	$(2x+3)(x+1)$ $\begin{array}{r} 2x+3 \\ x+1 \\ \hline +2x+3 \\ 2x^2+3x \end{array}$ **$2x^2+5x+3$**	$(2x+3)(x+1)$ $= 2x(x+1) + 3(x+1)$ $= 2x^2 + 2x + 3x + 3$ **$2x^2+5x+3$**
b)	$(2x+3)(x-1)$ $\begin{array}{r} 2x+3 \\ x-1 \\ \hline -2x-3 \\ 2x^2+3x \end{array}$ **$2x^2+1x-3$**	$(2x+3)(x-1)$ $= 2x(x-1) + 3(x-1)$ $= 2x^2 - 2x + 3x - 3$ **$2x^2+1x-3$**
c)	$(2x-3)(x-1)$ $\begin{array}{r} 2x-3 \\ \times\ x-1 \\ \hline -2x+3 \\ 2x^2-3x \end{array}$ **$2x^2-5x+3$**	$(2x-3)(x-1)$ $= 2x(x-1) - 3(x-1)$ $= 2x^2 - 2x - 3x + 3$ **$2x^2-5x+3$**

9 - Pg (40)